# metals review

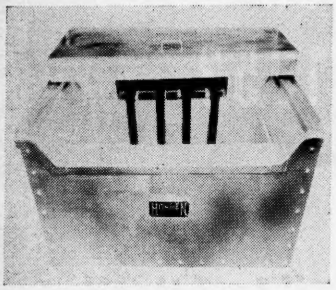
the news digest magazine

published by the american society for metals



Volume XXVI - No. 2 February, 1953

# HOLDEN SALT BATHS AND FURNACES



Electrode Furnace; Descaling-Carburizing-Hardening-Tempering.

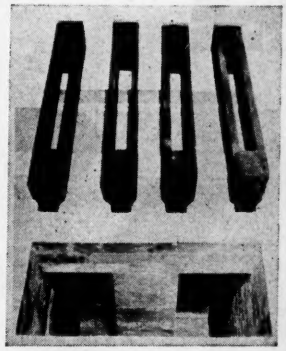
Heat treating in molten salt has in recent years increased considerably so that today it is firmly established as a method of heat treating having certain very definite advantages. Usually applied to small parts, the salt bath heats rapidly and with absolute uniformity.

With properly selected salts all steels can be hardened by unskilled labour with complete absence of scale and decarburization.

Salt baths may be heated by means of oil, gas or electricity and, in cases where large production is involved, they may be made continuous and automatic in operation.

### LIQUID CARBURIZING BATHS

For light and deep case hardening on all kinds of parts, such as gears, pressings and dies. Case depths up to .060". Parts easily cleaned in water after carburizing.



Type 701 Electrode Furnace with ceramic pot for neutral hardening and annealing 1000-2300° F.

### CARBON AND STEEL HARDENING BATHS

For hardening, without scaling or decarburization, carbon and alloy steels 1000°F.-2000°F. including air hardening die steels.

### HIGH SPEED STEEL HARDENING BATHS

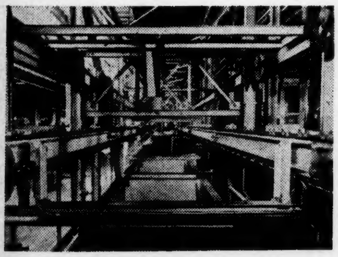
Investigate the new neutral baths: Hardening 185-10; High Speed 17-24AA-10; High Speed Preheat 13-17-10; Hard Brite AA-10. These salt baths increase life of both electrode furnaces and alloy pots.

### HY-SPEED CASE BATHS

For the secondary treatment of high speed steel tools to increase working life. Increase in tool life generally 100% or more.

### TEMPERING BATHS

For carbon alloy and high speed steels without scaling. Working range 300°F.-1100°F.



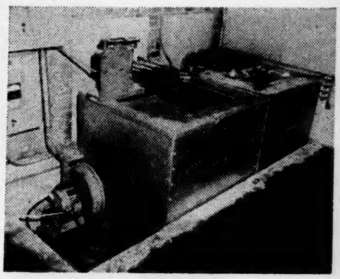
Salt Bath Processing Conveyors: Annealing, Hardening, Martempering, Austempering, Descaling.

### TYPE 701 ELECTRODE FURNACE

The Type 701 Submerged Electrode Furnace reduces radiation losses by 33-1/3%. This design can be used to replace any existing furnace with a ceramic pot, using a transformer with two, four or six electrodes. Operating temperatures 1000°F.-2300°F., with neutral salt baths.

### OTHER HOLDEN PRODUCTS

Baths for heat treating aluminum alloys, brass and other nonferrous metals. Baths for bright tempering, quenching, descaling, austempering and marquenching. Carbon reagents. Rectifiers. Lead pot covers.



Hardening and Austempering Unit for lawn mower blades and other martempering and austempering applications; production from 300 to 1000# per hour depending on rated capacities.

## THE A. F. HOLDEN COMPANY

P. O Box 1898 New Haven 8, Conn. 11300 Schaefer Highway Detroit 27, Michigan

# Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXVI, No. 2 February, 1953



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## IMPORTANT LECTURES



## DEPARTMENTS



## ASM REVIEW OF METAL LITERATURE

# Western Metal Congress and Exposition

The Western Metal Exposition, Mar. 23-27 in Los Angeles, has attained standards and dimensions which will make it the largest and most important display of metals and machinery yet blueprinted for the Pacific Coast. Heavy attendance by plant operators, metal engineers and other departmental executives is indicated by advance hotel registrations.

The Exposition, which will be held in the Pan-Pacific Auditorium, and the Congress, in the Hotel Statler, are announced as important educational factors which will be of benefit to all industry.

Scores of metal and technical engineers, working as volunteers, are setting up the programs and planning the displays. Western sections of 19 national technical societies are cooperating with the American Society for Metals which operates the show and meetings.

In the Exposition will be the largest display of American and foreign-made machine tools and tooling—in operation—yet shown on the Pacific Coast.

At the Congress, metal engineers and other technical experts from America's leading universities and industrial plants will deliver 100 papers on new metal developments.

Sessions will run concurrently. Programs will be presented by the American Society for Metals, and western sections of American Welding Society, Society for Non Destructive Testing, American Foundrymen's Society, Society for Automotive Engineers, and the Metals Division of American Institute of Mining and Metallurgical Engineers.

Thirty-seven papers are on the A.S.M. program. They will represent the research of twice that many authoritative investigators. Special sessions will be held on titanium and zirconium, stressing production, fabrication and application. Other A.S.M. topics will include aluminum, magnesium, and research recently conducted on alloyed steels.

American Welding Society sessions will be held on structural, industrial, submerged arc, resistance, spot and projection welding. Pipe and pressure vessels, aircraft and rocketry, brazing of bronze and fusion welding of titanium and stainless steel will be discussed. Other sessions will be dedicated to automatic arc-inert gas and aircraft flash and pressure welding, and welding research. Welding methods and applications will be demonstrated at the Exposition.

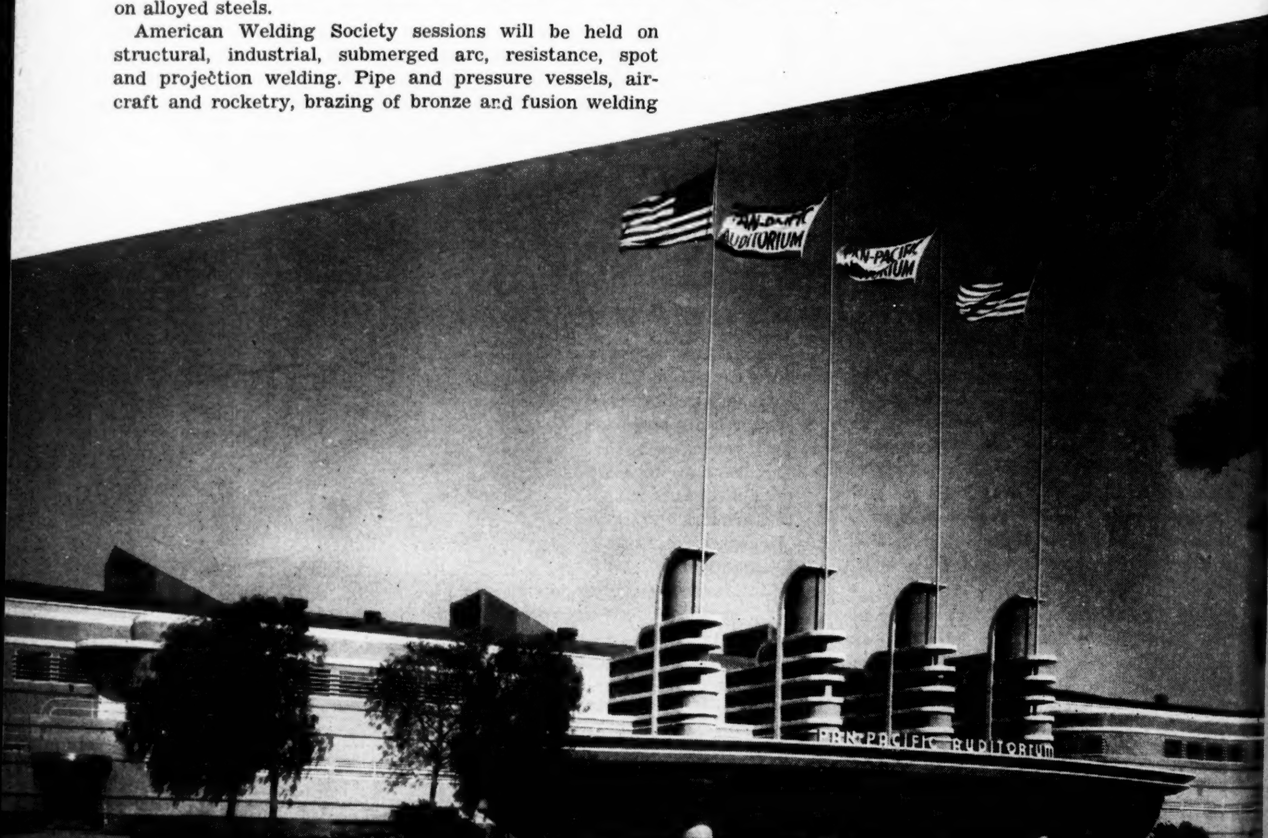
Technical meetings of the Society for Non Destructive Testing will include papers on casting of iron, steel and nonferrous metals, with programs directed to technical and management groups of the foundry industry.

A seminar of three evening sessions on ultra-high strength alloy steels for aircraft and automobiles will be held by the Society of Automotive Engineers—Southern California Section, on Mar. 23, 25 and 30. Topics will be materials and metallurgy, fabrication and processing, and design considerations.

Western sections of other societies cooperating with A.S.M. on the Exposition and Congress are:

Institute of the Aeronautical Sciences, Los Angeles Section; American Ordnance Association, Los Angeles Post; American Society of Tool Engineers; American Society for Testing Materials; American Society of Mechanical Engineers—Southern California Section; Purchasing Agents Association of Los Angeles; American Society of Heating and Ventilating Engineers; American Electroplaters Society; American Society of Civil Engineers; Structural Engineers Association of Southern California; American Society of Refrigerating Engineers; American Society of Safety Engineers; Pacific Coast Gas Association; and the American Ceramic Society.

There will be no admission requirement for those who attend the Congress sessions at the Hotel Statler. Those who hold membership cards in any of the cooperating societies will be admitted to the Exposition in the Pan-Pacific Auditorium, as will those who hold special invitations issued by exhibitors. All others will be admitted by paying a $1 registration fee.



# American Society for Metals

*Technical Program of*
*Western Metal Congress*
*Los Angeles—March 23-27, 1953*
*All Sessions in Golden State Room*
*Statler Hotel*

## Monday, March 23

*9:00 a. m.*

TITANIUM

Leo Shapiro, Douglas Aircraft Co., and A. E. Zezula, Airesearch Mfg. Co.—Co-Chairmen.

**Mechanical Properties and Strain Aging Effects in Titanium,** by F. D. Rosi and F. C. Perkins, Sylvania Electric Products, Inc.

**The Influence of Insoluble Phases on the Machinability of Titanium,** by R. M. Goldhoff, H. L. Shaw, C. M. Craighead and R. I. Jaffee, Battelle Memorial Institute.

**Mechanical Properties, Including Fatigue, of Titanium Base Alloys RC-130-B and Ti-150-A at Very Low Temperatures,** by S. M. Bishop, J. W. Spretnak and M. G. Fontana, Ohio State University.

**The Titanium-Oxygen System,** by E. S. Bumps, Studebaker Corp., H. D. Kessler and M. Hansen, Armour Research Foundation.

**The Martensite Transformation Temperature in Titanium Binary Alloys,** by Pol Duwez, California Institute of Technology.

**Isothermal Transformation of Titanium-Chromium Alloys,** by P. D. Frost, W. M. Parris, L. L. Hirsch, J. R. Doig, and C. M. Schwartz, Battelle Memorial Institute.

**Surface Hardening of Titanium by Carburizing and Induction Heat Treatment,** by A. J. Griest, P. E. Moorhead, P. D. Frost, and J. H. Jackson, Battelle Memorial Institute.

## Tuesday, March 24

*9:00 a. m.*

ZIRCONIUM
(Symposium)

John Chipman, Massachusetts Institute of Technology, and T. E. Piper, Consolidated Vultee Aircraft Corp.—Co-Chairmen.

**Zirconium Ores,** by O. C. Ralston, U. S. Bureau of Mines.

**The Preparation of Zirconium Powder,** by H. S. Kalish, Sylvania Electric Products, Inc.

**The Extractive Metallurgy of Zirconium by Fused Salt Electrolysis,** by M. A. Steinberg, M. E. Sibert and E. Wainer, Horizons, Inc.

**Some Aspects of the Iodide, or Hot-Wire, Process for Manufacture of Zirconium,** by W. M. Raynor, Foote Mineral Co.

**Manufacture of Zirconium Sponge,** by S. M. Shelton and E. D. Dilling, U. S. Bureau of Mines.

**Consumable-Electrode Arc Melting of Zirconium Metal,** by W. W. Stephens, H. L. Gilbert and R. A. Beall, U. S. Bureau of Mines.

**Fabrication of Zirconium,** by R. B. Gordon and W. J. Hurford, Westinghouse Electric Corp.

## Tuesday, March 24

*2:00 p. m.*

RESEARCH

D. S. Clark, California Institute of Technology, and F. J. Robbins, Sierra Drawn Steel Corp.—Co-Chairmen.

**Effect of Carbon and Boron on the Hardenability of a Case-Carburized Steel,** by R. A. Grange and J. B. Mitchell, U. S. Steel Co.

**Properties of Some Hydrogen-Sintered, Binary Molybdenum Alloys,** by W. L. Bruckart, M. H. LaChance, C. M. Craighead and R. I. Jaffee, Battelle Memorial Institute.

**Effect of Alloying Elements on Grain Boundary Relaxation in Alpha Solid Solutions of Aluminum,** by C. D. Starr, E. C. Vicars, A. Goldberg and J. E. Dorn, University of California.

**Resistance of Cast Iron Nickel Chromium to Corrosion in Molten Heat Treating Salts,** by J. H. Jackson and M. H. LaChance, Battelle Memorial Institute.

**A Precipitation Hardening Cu-N-Si-Al Alloy,** by B. B. Roach, R. B. Fischer and J. H. Jackson, Battelle Memorial Institute.

## Wednesday, March 25

*9:00 a. m.*

ZIRCONIUM
(Symposium)

A.T. Cape, Superweld Corp., and J. L. Waisman, Douglas Aircraft Co., Inc.—Co-Chairmen.

**Effect of Hydrogen on the Embrittlement of Zirconium and Zirconium-Tin Alloys,** by W. L. Mudge, Jr., Westinghouse Electric Corp.

**Determination of Hydrogen in Zirconium by the Hot Vacuum Extraction Method,** by R. K. McGeary, Westinghouse Electric Corp.

**A Simplified Procedure for the Metallography of Zirconium and Hafnium and Their Alloys,** by F. M. Cain, Jr., Westinghouse Electric Corp.

**Recovery of Cold-Worked Zirconium,** by W. A. Bostrom and S. A. Kulin, Westinghouse Electric Corp.

**The Solid Solubility of Tin in Alpha-Zirconium,** by G. R. Speich and S. A. Kulin, Westinghouse Electric Corp.

**The System Zirconium-Silicon,** by C. E. Lundin, D. J. McPherson and M. Hansen, Armour Research Foundation.

**The System Zirconium-Tin,** by D. J. McPherson and M. Hansen, Armour Research Foundation.

## Wednesday, March 25

*2:00 p. m.*

RESEARCH

A. E. Flanagan, University of California, and H. E. Flanders, University of Utah.—Co-Chairmen.

**The Effect of Dispersions on the Tensile Properties of Aluminum-Copper Alloys,** by R. B. Shaw, L. A. Shepard, C. D. Starr and J. E. Dorn, University of California.

**Austenite Stability and Creep-Rupture Properties of 18-8 Stainless Steels,** by J. K. Y. Hum, University of California, and N. J. Grant, Massachusetts Institute of Technology.

**Recrystallization of Wrought Hydrogen-Sintered Molybdenum and Its Alloys,** by M. H. LaChance, W. L. Bruckart, C. M. Craighead and R. I. Jaffee, Battelle Memorial Institute.

**A Study of the Mechanism of the Delayed Yield Phenomenon,** by T. Vreeland, Jr., D. S. Wood and D. C. Clark, California Institute of Technology.

**A Study of Factors Controlling Strength in the Torsion Test,** by R. D. Olleman, E. T. Wessel and F. C. Hull, Westinghouse Electric Corp.

## Thursday, March 26

*9:00 a. m.*

(Symposium)

J. R. Cady, University of Southern California, and Walter Crafts, Union Carbide & Carbon Research Laboratories.—Co-Chairmen.

**Observations on the Alpha-Beta Transformation in Zirconium,** by E. E. Hayes, E. I. du Pont de Nemours & Co., and A. R. Kaufmann, Massachusetts Institute of Technology.

**Some Properties of High-Purity Zirconium and Dilute Alloys With Oxygen,** by R. M. Treco, Bridgeport Brass Co.

**The Zirconium-Nickel Phase Diagram,** by E. T. Hayes, A. H. Roberson and O. G. Paasche, U. S. Bureau of Mines.

**The Zirconium-Manganese Phase Diagram,** by A. H. Roberson and E. T. Hayes, Northwest Electrodevelopment Laboratory, U. S. Bureau of Mines, and V. V. Donaldson, Alloy Pilot Plant.

**General Comparison of the Metallurgy of Zirconium With That of Better-Known Commercial Metals,** by Arthur D. Schwope, Battelle Memorial Institute.

**The Corrosion Resistance of Zirconium and Its Alloys,** by L. B. Golden, U. S. Bureau of Mines.

**Zirconium and Nuclear Reactors,** by Edward C. Miller, Metallurgy Division, Oak Ridge National Laboratory.

# Indianapolis Telecast Presents Science Achievement Awards Program

That work is going forward in publicizing the National Science Achievement Awards is quite evident from the letter below which was received from Carl E. Weber, publicity chairman of the Indianapolis Chapter A.S.M.

A short time ago the Indianapolis Chapter promoted the National Science Achievement Awards through an Indianapolis telecast.

The telecast was held in conjunction with Gilbert Forbes News Telecast. This news program is considered one of the most popular in the central Indiana area. Due to the lack of television coverage in this area, viewers have invested considerable sums in antennas and watch Indianapolis programs as far as 60 to 90 miles away. Therefore, I feel we had very good coverage. The individuals involved, in addition to Mr. Forbes, were Carl O. Sundberg, our chairman, Hugh A. Townsend, State Director, N.S.T.A. (National Science Teachers Association), and our local winner Thomas Steele.

I thought you might be interested in our attempt to publicize A.S.M. activities, and therefore, please find a copy of the script which we used. The script which was used on the telecast program is printed below.

FORBES—We have with us tonight a young man, a student of Howe High School, who has recently won a National Science Award, and two gentlemen who will explain the purpose of this award.

The National Science Teachers Association conducts this award and Hugh A. Townsend, Indiana state director and science instructor at McKinly Junior High School, Muncie, Ind., is present and will tell us the part his organization plays in this award. First, Mr. Townsend, will you explain the purpose of N.S.T.A. and this award.

TOWNSEND—N.S.T.A. is the National Science Teachers Association. It is a department of National Education Association, commonly known as N.E.A. N.S.T.A. is interested in better science education of our youth and promotes projects and services which I would like to tell you about. Since our time is limited, I will mention just the National Science Awards program for students and teachers. Its purpose is as follows:

First, to stimulate interest and encourage individual and small group experimentation and projects in science by junior and senior high schools on a very broad base in grades 7 through 12.

Second, to encourage higher regard for good science teaching in the schools by providing awards to those schools represented by student award winners.

Third, to recognize and reward science teachers who report outstanding efforts and effective techniques directed toward stimulating increased interest and activity in science among their students.

FORBES—How is this award conducted and sponsored?

TOWNSEND—N.S.T.A. judges the papers submitted by the students and teachers. The American Society for Metals sponsors the awards.

FORBES—Mr. Sundberg, why is your organization deeply concerned in the sponsorship of scientific thinking among students?

SUNDBERG — Mr. Forbes, the American Society for Metals is the engineering society of the metals industry and this industry is the largest employer of all types of engineers and scientists. There is a definite shortage of trained personnel. Industry can easily absorb 50,000 engineers a year, and this year only 27,000 will graduate. By contrast, Russia reportedly is graduating 100,000 engineers per year.

Therefore, the American Society for Metals is actively encouraging students to think about and prepare for their future. The sponsorship of this award program is one of several steps taken by our society to increase the number of trained people for research, engineering, teaching and technical work.

FORBES — Certainly there are plenty of opportunities for the young men and women of today in industry and science; also an excellent opportunity to win awards while preparing for their future. Briefly, what is the extent of these awards?

SUNDBERG — A total of 124 awards will be presented in 1953 throughout the United States and Canada, 104 to students totaling $5000 in cash and defense bonds, and 20 to teachers totaling $1000 in cash.

FORBES—And now we are most happy to meet Thomas Steele who is 15 years of age and a junior at Howe High School here in Indianapolis. Tom has been honored for his work in biology by the N.S.T.A. and received a 1952 Science Achievement Award. Tom is a consistent honor roll student and a potential science major.

Tom, we in Indianapolis are very proud of you. Tell us about your project and what part it plays in science.

STEELE—Mr. Forbes, my paper was written on tissue culture which is continuing growth of living cells from animals in an artificial medium and observing their growth and behavior.

My procedure was to open an egg using sterile instruments and remove the thighbone from the living embryo which was two weeks old. I then put the thighbone in a glass dish containing a nutritional substance for the bone. The dish was placed in an incubator and carefully observed. The importance of tissue culture is the study of living cells in cancer research.

FORBES—Tom, I understand that your award was presented at a general assembly on Nov. 12. Tell us about this.

STEELE—Yes, my award was a $50 defense bond and Howe High School received $50 cash for the science department. I would like to encourage other students to pick a project and enter this contest since it provides a goal to work toward.

I also would like to thank my science teacher, Mr. Klinge, for his help and encouragement.

FORBES — I understand your teacher, Paul Klinge, won a Science Teachers Award. Is that correct, Mr. Townsend?

TOWNSEND—Yes, Mr. Forbes, Tom's teacher, Mr. Klinge, won a separate award for his special paper concerning teaching of science.

FORBES—Briefly, what must the student do to enter this coming year's contest?

TOWNSEND—First, start now on a project, investigation, or other special activity in some field of science or mathematics. Second, consult with your science teacher, who is ready and able to assist you and has the official entry forms. Third, complete the entry form and send to the address shown.

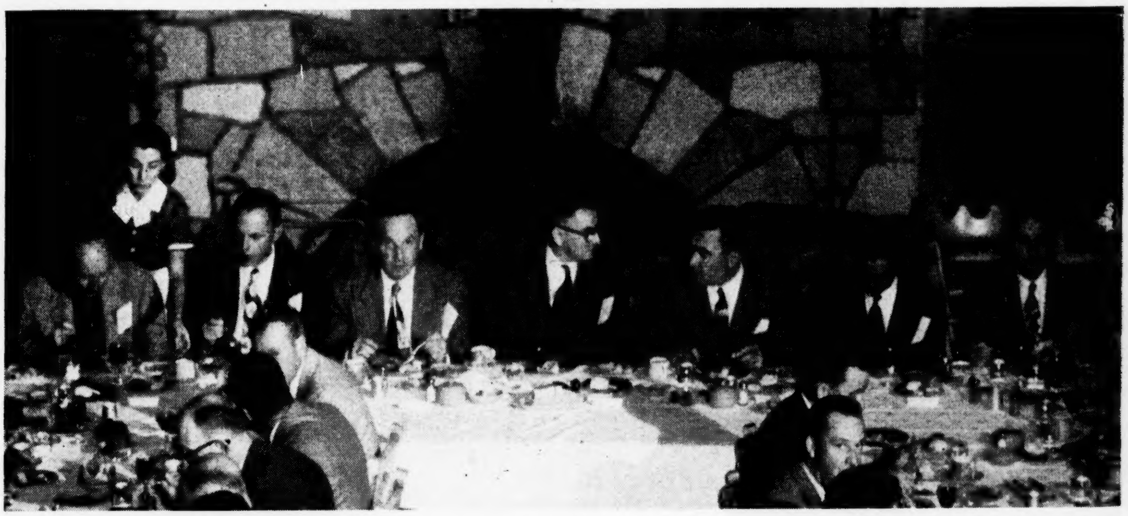
We wish the best of luck to the entrants for next year.

## International Iron And Steel Meeting Is Scheduled for May

The International Iron and Steel Meeting, which is arranged by the Centre National de Recherches Metallurgiques—Section de Liege, in collaboration with the Societe Francaise de Metallurgie, the Verein Deutscher Eisenhuttenleute, and the Iron and Steel Institute, will be held in Liege, Belgium, on May 7, 8, and 9, 1953.

The program will include sessions on "Low-Shaft Furnaces", "Conversion of Iron", and "Blowing Through the Top of a Converter". All sessions will be held in the Academic Hall of the University at Liege. Those who wish to take part in the meeting should write to A. Gillet, secretary of the Board of Administration, Centre National de Recherches Metallurgiques, 12 Quai Paul Van Hoegaerden, Liege, Belgium, so that registration papers may be sent to them.

# ASM-SNT Joint Meeting Held at Los Alamos



*Shown at the Head Table at a Joint Meeting of the Los Alamos Chapters A. S. M. and the Society for Non Destructive Testing Are, From Left: J. D. Steely, A. S. M. Executive Committee; N. C. Miller, President, S. N. T. Los Alamos Chapter; G. H. Tenney, National Vice-President S. N. T.; R. C. McMaster, National President S. N. T., Guest Speaker; F. H. Ellinger, Chairman, Los Alamos Chapter A. S. M.; D. E. Grimm, Vice-Chairman; Los Alamos Chapter A. S. M.; and J. W. Dutli, Past President, Los Alamos Chapter S. N. T.*

Reported by Reed O. Elliott
***Physical Metallurgist***
***Los Alamos Scientific Laboratory***

A joint dinner meeting of the Los Alamos Chapters A.S.M. and the Society for Nondestructive Testing was addressed by Robert C. McMaster, National President of S.N.T., at Los Alamos in November. Dr. McMaster, who is supervisor of the electrical engineering division and nondestructive test development laboratory, Battelle Memorial Institute, spoke on "Nondestructive Testing".

Dr. McMaster pointed out that nondestructive tests depend either on the transport of matter or the transfer of energy and likened them to the five human senses. Since evaluation of tests requires background experience and judgment, he stressed the need for technically trained people in this rapidly expanding field.

As an example of a commercial use for nondestructive tests, Dr. McMaster described the workings of a coin-operated vending machine such as might be used for the sale of soft drinks or cigarettes. A small compact unit, which costs about $10, gages the coin mechanically for diameter and thickness, checks for proper weight, probes the coin for detection of hollow center and rejects magnetic coins or coins not having the proper resistivity, modulus of elasticity, or hardness. This representative case illustrates the fact that a single nondestructive test cannot be expected to give conclusive evidence that an item being tested should be retained in a production line, but that a complete series of tests is necessary.

The basic principles of nondestructive testing and some typical industrial applications were illustrated with lantern slides. The major fields included visual and X-ray examination, radioactive isotopes, penetrants, ultrasonic, and magnetic methods. Xeroradiography was emphasized as an outstanding recent development because of its low cost and because the radiograph image is available for inspection a few seconds after exposure. Plates may be used over and over again so that the major cost is only that of the developer and the ordinary paper used if permanent records are desired.

## Educational Committee Sets 1953 Congress Program

The A.S.M. Educational Committee (M. J. Day, chairman) has completed plans for three educational lecture series to be presented during the 35th National Metal Congress to be held in Cleveland next October. Technical subjects decided upon by the Committee are: "Fatigue", "Surface Protection Against Wear", and "Surface Protection Against Corrosion".

F. G. Tatnall, N. C. Jessen, and J. O. Lord have been appointed lecture chairmen of the respective series.

# Speaks on Carbide Machinery in Boston

*A. O. Schmidt (Center) Gave a Talk on "Practical and Theoretical Inter-Relations in Carbide Machinery" at the December Meeting of the Boston Chapter A. S. M. Shown with Mr. Schmidt are John L. Morisini (left), technical chairman of the meeting, and William L. Badger, chapter chairman*

# *Oak Ridge Learns About Ductile Cast Iron*

*K. D. Millis (Right), of International Nickel Co.'s Development and Research Division, Discussed "Ductile Cast Irons" at the November Meeting of the Oak Ridge Chapter. J. M. Case (left) was technical chairman*

Reported by G. M. Slaughter
***Metallurgist***
***Oak Ridge National Laboratory***

"Ductile Cast Irons" was the subject discussed by K. D. Millis of International Nickel Co.'s Development and Research Division at the November meeting of the Oak Ridge Chapter.

Through the use of magnesium additions as nucleating agents, spheroidal graphite can be made to form in cast iron in the as-cast condition. Graphite in this form imparts good ductility to cast iron without removing its excellent fluidity and castability. The ductility of this material after a relatively short annealing cycle is higher than that of the malleable cast iron formed from long annealing treatments on white cast iron. In the as-cast condition it also exhibits an appreciable amount of ductility, dependent of course on the composition.

Ductile irons exhibit a linear portion of the stress-strain curve, whereas there is no portion of the gray cast iron curve where stress is proportional to strain. The elastic modulus of ductile iron is between $2.4 \times 10^7$ and $2.6 \times 10^7$. A definite relationship exists between the hardness of ductile cast iron and its tensile strength and elongation. This relationship reflects the relative amounts of constituents in the microstructure, such as pearlite and ferrite.

Silicon contents up to 3% are generally used in ductile irons. Section size and post-casting treatment should control the amount of silicon used. The higher silicon contents should be employed for as-cast materials for full graphitization. In irons to be annealed, the silicon should be kept low since it is a ferrite hardener. Manganese contents are kept below 0.40% unless a highly pearlitic structure is desired. Low phosphorus contents are desirable, and sulphur is negligible in ductile irons since the magnesium floats most of it out in the slag. Nickel additions to ductile iron promote the formation of pearlite since this metal is an austenite stabilizer.

Ductile iron has several characteristics which make it highly desirable as an engineering material. Its wear resistance is better than that of gray cast iron. Whereas gray cast iron will oxidize along graphite flakes and grow internally, ductile iron is relatively free from this tendency and therefore is a good material for elevated temperature usage. The machinability of ductile iron is far superior to gray cast iron of the same hardness level. This material is readily welded with recommended electrodes and is amenable to flame hardening. The combination of its excellent elastic modulus, fatigue properties, and wear resistance makes this a logical metal to be used in the fabrication of cam and crankshafts.

Although the commercial production of ductile cast iron is a relatively new field, the cost of this material is such as to make it a strong competitor in applications where its inherent engineering properties are desirable.

## Inland Empire Enjoys Christmas Party

The Inland Empire Chapter A.S.M. held its annual holiday party in Spokane, Wash., on Dec. 12. Fifty-four members and guests enjoyed the celebration which started with a cocktail party, followed by the traditional Christmas buffet.

Stan Channon, master of ceremonies, directed the panel of six members chosen to compete in the quiz contest "Twenty Questions". The film "A Look at Tomorrow" was shown, and the evening's entertainment was climaxed with dancing until midnight.

Chairman T. J. Summerson, and his Program Committee, Stan Fergin, Amon Groves, Jackie Loveless and Harry Miller, were responsible for the good time enjoyed by all present.

## *Technical Papers Invited For A.S.M. Transactions*

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1954 *Transactions* and probable presentation before a national meeting of the Society. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the Society.

Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 35th National Metal Congress and Exposition to be held in Cleveland, Oct. 19 to 23, 1953. Papers that are selected for presentation will be printed and manuscripts should be received at A.S.M. headquarters office not later than April 10, 1953.

Acceptance of a paper for publication does not necessarily infer that it will be presented. The selection of approved papers for the convention program will be made early in June.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

# Fort Wayne Hears Shell Molding Talk

Reported by A. D. Carvin
*Joslyn Stainless Steels*

"Shell Molding" was discussed by E. Edwin Ensign, vice-president of the Applied Research and Development Corp., at the December meeting of the Fort Wayne Chapter.

Mr. Ensign introduced his subject by explaining that shell molds are manufactured from a mixture of sand and plastic binder baked on the pattern, forming a shell. Several variations of phenol formaldehyde resins are used as plastic binders. Sands with fineness of 90 AFS to 130 AFS are used. The sand and plastic must have an extra low moisture content. During the baking of the shell, the plastic first melts and wets the sand particles and, with continued baking, the plastic solidifies. The molds are very permeable so that venting does not have to be designed into the molds.

The patterns are made from metal. Brass, aluminum, cast iron, and steel have been used satisfactorily. Most care must be used with aluminum patterns because the surface of this metal is easily marred in handling. The pattern should be well cleaned after each shell is removed so that a coating of baked plastic does not build up on it, thus destroying the close dimensional tolerance obtainable in the casting.

The pattern is preheated to around 450° F., a coating of parting material is added, the mixture of sand and plastic is poured on the pattern, the excess is dumped off, and a movable oven is moved over the mixture, so that the shell bakes both from the inside and from the outside.

The mold mixture, prior to baking, is quite dusty because of its fineness. A satisfactory dust suppressant has not as yet been developed. Much care has to be exercised in blending the sand and plastic together. Good blending is difficult because the two ingredients have different densities and particle sizes.

The shell, when taken from the pattern, is flexible so it must be immediately placed on a straightening plate in order to set in the proper shape. Aluminum makes very satisfactory straightening plates because of its thermal conductivity.

After each half of a mold has been prepared, the pieces are fastened together by one of two methods: cementing, or with clips. Cementing is superior because clips hold the shells together only at the edges. The same resin that is used in the mixture can be used as a cement and the two shells can be placed together while they are still warm enough to melt the resin.

Molds should be designed mechanically rigid and should be stored in a dry place. Some molds must be supported if the metal-static pressure is great enough to break them. In some cases lead shot is used as a support and sometimes green sand is used. Green sand with 3% moisture can be left around a mold for about 2½ hr. before the mold is used. Any more than that would impart too much moisture to the mold for producing a satisfactory casting.

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## Stresses Need of Selecting Proper Bearing Materials

Reported by A. S. Vince
*Royal Canadian Mint*

At the November meeting of the Ottawa Valley Chapter, A.F. Underwood, head of Mechanical Engineering Department 5 of the Research Division, General Motors Corp., discussed the many aspects of automotive bearings, with particular reference to their testing and development. His talk was entitled "Bearings; Testing and Application of Bearing Metals".

Mr. Underwood stressed the point that selection of bearing materials is a compromise between several conflicting properties, and it is dangerous to select bearings as a result of laboratory rather than service tests. The main bearing factors of fatigue life, resistance to corrosion, resistance to deformation, and score resistance, were discussed. It was shown that bearings listed in order of merit from a fatigue viewpoint are in reverse order of merit when considering desirable deformation characteristics. In view of this, laboratory test machines had to be designed which would simulate service conditions, and a fatigue machine of this type was illustrated by the speaker.

A number of slides showing various types of bearing failure were shown and modern developments in bearing technology described. Perhaps the most positive advance in this connection has been the development of very thin babbitt bearings. The use of special bearing alloys, such as the sintered copper-nickel base surfaced with a lead babbitt and special "grid" bearings, was mentioned. Mr. Underwood also described the use of light alloy bearings, and the methods that have been developed for successfully bonding thin layers of aluminum alloy to the steel backing to form a typical automotive bearing.

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# *Quality Control Theme of Texas Talk*

*Present at the December Joint Meeting of the Texas Chapter A. S. M. and the South Texas Section of the A. S. Q. C. Were, From Left: Rolland Crouch, President A. S. Q. C.; W. R. Weaver, Who Spoke on "Quality Control in the Metals Industry"; M. W. Phair, A.S.M. Chairman; W. M. Crook, A.S.M. Vice-Chairman; and C. F. Lewis, Cook Heat Treating Co. (Photo by Lee Dolan)*

Reported by Joe B. Marx
*Sheffield Steel Corp.*

"Quality Control in the Metals Industry" was the subject of a talk given by Wade Weaver, director, steel conservation and quality control, Republic Steel Corp., before a joint meeting of the Texas Chapter A.S.M., and the South Texas Section of the American Society for Quality Control, in December.

Mr. Weaver's background of 20 years as a metallurgical engineer in the steel industry and his experience in applying quality control methods to steel mill problems enabled him to present many cases where quality control aided in cost savings in addition to helping to produce a better product.

He warned his listeners to be suspicious of averages. Many times an average will obscure an important item that could be uncovered by using other quality control methods. Quality control must be studied before starting to attack a problem.

Mr. Weaver explained how quality control was put into effect at his own company. Slides were shown of several case histories of actual problems at Republic, some of which were: measurement of Rockwell hardness of Garand rifle sights; charting of strip widths on a continuous strip mill; slab weight variation—how a sampling plan helped solve this problem; control chart on plate thicknesses; fuel evaluation; and reduction of area vs. pouring temperatures. After checking all other variables it was found that the pouring temperature directly affected the reduction of area.

# Gives Points on Eliminating Ship Plate Fracture

Reported by Walter Showak
*Pennsylvania State College*

Samuel Epstein, research engineer for the Bethlehem Steel Co., addressed the Penn State Chapter in November on "Embrittlement of Ship Plate Steel."

Ever since World War II, when many of the wartime welded ships fractured, much research has been done on the brittle behavior of ship plate steel. During the war and after more than 60 ships suffered very serious fracture causing the loss of a number of lives and of about 40 million dollars. All the fractures occurred in welded ships. The fractures all started at welds and then proceeded through the plates. Horizontal riveted seams will stop the passage of such fractures and riveted seams are, therefore, being used as a safety measure to limit the extent of fracture if it should start.

Mr. Epstein pointed out that brittle fracture can occur either after repeated loading, as in fatigue, or after a single application of load, as in a notched-bar impact test. The main factor in causing brittle behavior in fatigue and in single loading is the notch. To prevent embrittlement, then, a most important thing is design, or the avoidance of notches.

In preventing failure by fatigue we can do very little metallurgically except to strengthen the steel. But in preventing brittle failure in single loading there are several metallurgical recourses that can be utilized. By controlling the composition, deoxidation, and grain size of the steel, the susceptibility to brittle fracture in single loading can be decreased.

Notched ship plate steel gives a ductile fracture at ordinary temperatures but as the temperature is lowered a point is reached at which the fracture becomes brittle. This has been called the transition temperature. The fractured ships failed in cold winter weather and the inference was drawn, therefore, that the failures were related to this phenomenon of the transition temperature. This received strong confirmation in the studies made by the National Bureau of Standards of the steel from the fractured ships. The studies showed that the ship fractures tended to originate in welds in plates which had a high transition temperature but not in welds in plates which had a low transition temperature.

To guard against brittle fracturing in ships, the American Bureau of Shipping is requiring steel of special composition and deoxidation practice. Lower carbon, higher manganese ship plate steel has been found to have lower transition temperatures. And fully aluminum-killed steel of this composition, as against the more commonly used semikilled steel, shows still lower transition temperatures. Thicker plate steel generally has a higher transition temperature than thinner plate steel. Accordingly the American Bureau of Shipping is requiring the lower carbon, higher manganese semikilled steel for plates between ½ and 1 in. thick and the lower carbon, higher manganese fully aluminum-killed steel for plates over 1 in. thick.

Data were presented on tests of a large number of run-of-the-mill heats of these new classes of ship plate steel and also of the old ship plate steel such as was used in the wartime ships. The transition temperatures in the new classes of steel were shown to be definitely lower than in the wartime ship plate steel.

The conclusion was drawn that proper use of these new steels plus recent improvements in design and workmanship should virtually eliminate risk of brittle ship failures.

# National Officers Night Opens 1952-53 Season in New York

Reported by I. M. Hymes
*International Business Machines Corp.*

The November meeting of the New York Chapter, which was National Officers' Night, featured Ralph L. Wilson, director of metallurgy, Timken Roller Bearing Co., and president of A.S.M. Mr. Wilson's talk was concerned with concise information on the relationship of hardness and toughness in low-alloy steel.

# *Canadian Chapters Hold Annual Luncheon*

*The Canadian Chapters of the American Society for Metals Held Their Annual Joint Luncheon Recently. R. L. Wilson, national president, who was a guest at the luncheon, presented a talk on the educational plans of the Society. Shown are, from left: E. McGinnin and P. F. Cornish, Ontario past-chairmen; Ben Dixon, Ontario vice chairman; J. S. Edgar, Ontario chairman; W. B. Billingsley, Montreal chairman; F. M. Cazalet, British Columbia past chairman; R. L. Wilson; G. M. Young, Montreal past chairman; W. C. Kimble, Northern Ontario past chairman; and J. W. Pawley, Northern Ontario chairman*

## Dr. Hansen Outlines Characteristics of Titanium at Calumet

Reported by W. P. Ruemmler
*Eagle-Picher Co.*

The very great value of early physical metallurgy research in the titanium program was stressed when Max Hansen, chairman of the metals research department, Armour Research Foundation, addressed the Calumet Chapter in December. In his talk, "Titanium Alloys: Their Constitution, Structure, and Transformation Characteristics", Dr. Hansen pointed out that, for the first time in metallurgical history, such studies are running concurrently with, or even preceding, commercialization of the metal. Dividends are already becoming evident through logical and fruitful titanium alloy development programs.

Dr. Hansen discussed the physical and mechanical properties of unalloyed titanium and the three general types of binary alloy systems which titanium can form. Two system types involve stabilization of the high-temperature beta phase and lowering of the transformation temperature, one resulting in a eutectoid decomposition of this phase (as iron, chromium, or manganese), the other involving stabilization of this phase down to room temperature (as molybdenum or vanadium). A third type of system involves stabilization of the low-temperature alpha phase and raising of the transformation temperature (as oxygen, nitrogen, or aluminum).

Dr. Hansen stated that, knowing the phase diagrams of the various titanium systems, the next requisite to putting titanium and its alloys to use is a knowledge of their transformation characteristics, the structures obtained, and how to control them. Such proven tools as time-temperature - transformation and Jominy-type end-quench studies were borrowed from ferrous metallurgy to throw light on these subjects. Dr. Hansen showed TTT-charts for beta-isomorphous and eutectoid prototype systems and described the techniques employed in determining these for titanium alloys. By correlating these charts with mechanical properties, desirable structures and the heat treatments by which they can be obtained are understood.

Jominy-type end-quench tests demonstrated that quench hardening is not the most prevalent mechanism in most titanium alloys, but that many display age hardening behavior. The martensites, or alpha prime structures, obtained in titanium alloys were shown to be relatively soft structures as compared to their counterparts in the steels.

Fruits of alloy development programs guided by the preknowledge of physical metallurgy behavior are already in evidence. Dr. Hansen cited as an example titanium alloys which, in the laboratory, are outperforming by a wide margin commercial titanium alloys, and Types 304 and 403 stainless steels in creep rupture at 1000° F.

## Stout Tells How Fabrication Methods Affect Steel Properties

Reported by A. E. Leach
*Metallurgist, Bell Aircraft Co.*

Laboratory tests for mechanical properties of materials seldom are good criteria for judging the serviceability of a fabricated assembly. Metallurgists must consider the effects of fabrication on properties for quite often these will drastically alter tensile strength, impact resistance, or fatigue endurance limit.

Prefacing his talk "The Effect of Fabrication on Steel Properties" with these remarks. Robert D. Stout, professor of metallurgy at Lehigh University, addressed a joint meeting of the Buffalo Chapter A.S.M. and the local chapter of the American Welding Society in December. Dr. Stout continued to develop many of the relationships between fabrication methods and final properties.

For instance, prestraining structural members will raise the yield strength in the longitudinal direction, but it should be remembered, he said, that the yield strength in the transverse direction will be lowered at first, and raised less rapidly with increasing strain.

In his past testing experience, Dr. Stout had observed that the impact strength of welded plate can be kept high by use of proper welding conditions, but low heat input welds, such as tacks or arc-strikes, frequently lead to brittle fracture. He also observed that impact resistance can be affected by other means of fabrication than welding. Tests on specimens with sheared edges resulted in a higher impact transition temperature than machined specimens of the same material. Flame cutting raises transition temperature, but not as much as does shearing.

Welding will affect fatigue strength in the plastic range of loading adversely at high levels of strain, but at low levels it will not alter the cycles to failure.

For a structure which will be subjected to fatigue conditions, it is much more important to have high tensile strength than ductility. However, if impact is a consideration, then greater attention must be paid to the latter, for higher ductility generally means greater toughness.

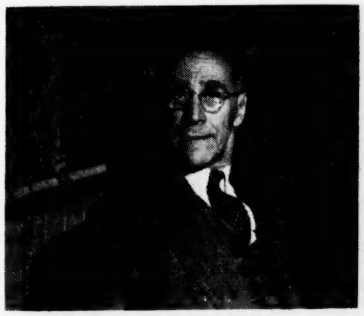
## Kansas City Completes Educational Course

Reported by K. E. Rose
*University of Kansas*

Approximately 100 attended the 8-week educational program given by the Kansas City Chapter this past fall. The program was organized and managed by F. A. McCoy, chief metallurgist, Sheffield Steel Corp., assisted by James G. Cametti of Westinghouse Electric Corp. and by M. L. Powers, Linde Air Products Co. Lecturers for the eight meetings were selected from the chapter membership. The subjects and speakers were:

**Material Specifications,** by J. M. Goldsmith, chief inspector, Sheffield Steel Corp., and David Lewis II, materials and standards engineer, Bendix Aviation Corp.

**Steelmaking**, by W. H. Steinheider, openhearth metallurgist, Sheffield Steel Corp., and C. E. Akers, chief metallurgist and plant engineer, Locomotive Finished Material Co.



*F. A. McCoy*
*Educational Committee*

**Welding,** by M. L. Powers, service engineer, Linde Air Products Co.

**Corrosion,** by C. G. Hummon, chief chemist, Sheffield Steel Corp.

**Principles of Heat Treating,** by Kenneth E. Rose, professor of metallurgy, University of Kansas.

**Magnesium and Aluminum Alloys,** by H. D. Beeson, sales engineer, Aluminum Co. of America, and L. E. Campbell, chief engineer, Benson Manufacturing Co.

**Nondestructive Testing,** by W. F. Alderson, supervisor of materials department, Buick, Oldsmobile, Pontiac.

**Statistical Quality Control,** by H. A. Springer, metallurgist, Sheffield Steel Corp., and national director, Kansas City Section, American Society for Quality Control.

### CORRECTION

H. Edward Flanders, professor of metallurgy at the University of Utah, has been awarded the second prize in the Eutectic Welding Alloys Corp.'s competition, rather than the first prize, as was announced in the December issue of *Metals Review*.

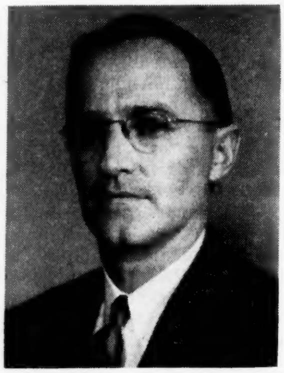
# Herty, A.S.M. Past President, Dies Suddenly

Charles Holmes Herty, Jr., assistant to the vice-president of Bethlehem Steel Co.'s steel division, died suddenly January 17. He was 56 years old. He had been with Bethlehem since 1934. He was National President of the American Society for Metals in 1946; a Campbell Memorial Lecturer in 1931; winner of the Sauveur Achievement Award in 1943, and chairman of the Metals Handbook Committee from 1933-1936.

Dr. Herty became widely known during and after World War II for his work on the conservation of manganese and other raw materials of steelmaking. His greatest achievement, however, was clearly of even more vital importance, for it is a matter of record that he fathered, in this country at least, the science of physical chemistry of steelmaking. Thirty years ago there was little appreciation of the fact that steelmaking reactions are subject to the laws of physical chemistry, and suitable data in this field were practically nonexistent.

That Dr. Herty perceived the problem and met its challenge is attested by the title of his doctorate dissertation: "The Interreaction Between Gas, Slag, and Metal in the Basic Openhearth Process."

His studies of the problem were continued in Massachusetts Institute of Technology's School of Chemical Engineering Practice; at the U. S. Bureau of Mines, Pittsburgh Station, with the Metallurgical Advisory Board, Pittsburgh; and finally with Bethlehem Steel Co., with results soon to be known and quoted throughout the world. The work shed light upon such subjects as sulphur distribution between gas, slag, and metal; rate of carbon reaction; manganese equilibrium; deoxidation reactions and formation of inclusions, and others too numerous to list here.



*C. H. Herty, Jr.*

The published findings of Dr. Herty and his students and associates during that 20-year period are a lasting monument to his achievements. And although during recent years the press of other duties reduced his participation in the studies of the physical chemistry of steelmaking, his interest never waned. He virtually bristled with ideas and suggestions, and his infectious enthusiasm was bound to rub off on others, as did his unfailing good humor and inability to say an unkind word about anyone. He was a Christian gentleman in the truest sense of the word.

## Industrial Atomic Power Highlights Talk At Saginaw Valley

Reported by William C. Cole
*AC Spark Plug Div.*
*General Motors Corp.*

John J. Grebe, research counsellor at Dow Chemical Co., and currently head of an industrial atomic power project for his company, presented a talk on "Industrial Atomic Power" at the November meeting of the Saginaw Valley Chapter. In his talk, Dr. Grebe elaborated on the economics, politics and design of an industrial atomic power plant.

Atomic power is at present a government monopoly, but forward-looking industrialists are very interested in it as an economical source of power for industry in the future. The approach of private industry to the problems involved would differ from governmental agencies in that private industry would consider the project on a profit-making basis that would not require any government subsidy.

The use of atomic power in industry is not expected to alter the economics of the nation because the cost of coal used for power is only about 1% of our total expenditures. Ten pounds of uranium will produce as much power as 10,000 tons of coal; therefore, the location of operations requiring large quantities of power would not be restricted to areas where natural power is available. The cost of electricity in homes would not be affected because most of the cost is in distribution and that would remain the same regardless of the initial cost of the power.

## Obituaries

**William E. Karnuth**

William E. Karnuth, district sales manager of Peter A. Frasse and Co., Inc., Syracuse, died suddenly in December. Mr. Karnuth was a sales engineer with the Frasse Buffalo District from 1923 to 1950, when he was appointed to the position he held at the time of his death.

**Sherman S. Graves**

Sherman S. Graves, 39, manager of Cessna Aircraft Co.'s Helicopter Division, was killed in an airplane accident at Indianapolis in December. Mr. Graves was a charter member of the Wichita Chapter and has always been most interested and active in chapter activities.

**James Taylor**

James Taylor, 58, metallurgical engineer at the Schenectady plant of the American Locomotive Co., died suddenly in December. He was a member of the Eastern New York Chapter.

## *Worcester Hears Machinability Talk*

*Malcolm F. Judkins, Chief Engineer, High Temperature Alloys Division of Firth Sterling Steel & Carbide Corp., Spoke on "Machinability of Metals" at the December Meeting in Worcester. Shown are, from left: Wendell J. Johnson, chairman; Mr. Judkins; and Leonard L. Krasnow, technical chairman of the meeting. (Reported by C. Weston Russell).*

# Inland Empire's Lecture Course Speakers

*The Course on "Aluminum and Its Alloys" Currently Being Conducted by the Inland Empire Chapter A.S.M. Includes Talks by (Reading From Left) J. B. Hess, G. H. Kissin, F. M. Krill, E. W. Everhart, W. J. Lawler, chairman, A. L. Mowry, D. W. Smith, V. F. Binkley, and F. R. Morral, educational committee*

The Inland Empire Chapter A.S.M. is currently conducting an educational course on "Aluminum and Its Alloys", which meets on Tuesday evenings at Gonzaga University Lecture Hall in Spokane, Wash. Lecturers and their subjects are as follows:

**Feb. 3**—Introduction to the Aluminum Industry, by D. W. Smith.

**Feb. 10**—Principles of Aluminum Physical Metallurgy, by J. B. Hess.

**Feb. 17**—Commercial Casting Alloys, by A. L. Mowry.

**Feb. 24**—Commercial Wrought Alloys, by W. J. Lawler.

**Mar. 3**—Heat Treatments, by V. F. Binkley.

**Mar. 10**—Corrosion, by E. W. Everhart, and Finishing, by G. H. Kissin.

**Mar. 17**—Metallography of Aluminum Alloys, by F. M. Krill.

**Mar. 24**—Economics of the Aluminum Industry, by Dean Maurice Lee.

The registration fee of $4 for ASM members and $5 for nonmembers includes textbook. W. J. Lawler is course chairman.

## Hear Stress Relief Annealing Talk at Eastern New York

Reported by John M. Gerken
*Rensselaer Polytechnic Institute*

"Stress-Relief Annealing of Stabilized Stainless Steels" was the subject of a talk given by Lorin K. Poole, a project engineer with the Arcos Corp., at Eastern New York Chapter in November.

Mr. Poole stated that a survey of field troubles revealed that Type 347 stainless steel caused the most difficulty during the stress-relief annealing following welding. This trouble generally takes the form of intergranular cracking in the weld and heat-affected zones and appears after the stress-relief annealing treatment. In a typical example, the stress-relief treatment used was to heat at 50° F. per hr. to 1700° F., then cool at 50° F. per hr. A microscopic examination of these cracked welds indicated that brittle sigma phase was present in the weld metal and, in this case, a brittle, intergranular phase was present in the heat-affected zone.

Mr. Poole indicated that the factors which contribute to low mechanical properties are annealing temperature and time, heating and cooling rate, grain size of the parent metal, composition of the weld deposit and type of electrode coating.

Stress-relief annealing at temperatures between about 1200 and 1700° F. results in the formation of a network of brittle sigma phase which transforms from the ferrite islands in the weld metal. Temperatures above 1750° F. agglomerate the ferrite, thereby minimizing the embrittling effect of any sigma formed during cooling. Temperatures in the range of 1300 to 1500° F. result in the most brittle structures.

A final weld structure with 5 to 8% ferrite is necessary to prevent the formation of microfissures in the austenite. A high C-Si ratio was also found to be desirable to achieve this.

In applications involving heavy sections and high restraint, titania-coated electrodes rendered the weld more susceptible to cracking than lime-coated electrodes.

The recommended practice to minimize cracking is to use a fine-grained steel, weld with lime-coated electrodes which give the proper ferrite-to-austenite balance in the weld deposits, and heat and cool at a minimum of 200° F. per hr. to and from a stress-relieving temperature of 1750° F. or above.

### Phoenix Has New Secretary

John Decker has resigned his position as secretary of the Phoenix Chapter A.S.M., and Clarence Prather has taken over all the duties of this office. Mr. Prather is with Comstock Steel and Supply Inc.

## West Michigan Giving Course On Elementary Metallurgy

The West Michigan Chapter has announced the start of a six-lecture course in "Elementary Metallurgy", especially designed for workers and technicians in the metal industry without previous metallurgical training. L. J. Haga, president of State Heat Treat, Inc., is the instructor. The lectures are being held on Wednesday evenings at the Muskegon Junior College, Muskegon, Mich. Registration fee is $3. The first lecture was held on Jan. 14.

## New Uses for Aluminum

Reported by James C. Farlow
*American Cast Iron Pipe Co.*

"New Applications for Aluminum" were presented by R. P. Kytle, Jr., director, foil and sheet products, Reynolds Metals Co., at the November meeting of the Birmingham Chapter.

Mr. Kytle gave a brief history of the aluminum industry and discussed its growth, predicting that the expected production of aluminum in 1953 will be approximately three billion pounds. Most of the metal that is produced today is used in defense requirements; its second largest use is in building materials. New developments in the use of aluminum include foil packaging of food, and the labels for these packages. One point brought out by Mr. Kytle was the attractiveness of these labels as an advertising medium.

Use of aluminum in the electrical and automotive fields was discussed, with descriptions of present experimental aluminum cars that several manufacturers now have on the road. Mr. Kytle closed his discussion with a description of new building products, such as show cases, counters, curtain walls, and other items where strength versus weight reduction are of prime importance.

# Advantages and New Applications of Gray Iron Castings Given

Reported by James C. Farlow
*American Cast Iron Pipe Co.*

The December meeting of the Birmingham Chapter featured C. O. Burgess, technical director of the Gray Iron Founders' Society, who spoke on "Engineering Applications of Gray Iron".

Mr. Burgess's talk covered three major points of interest: advantage of gray iron castings and of the casting process, the physical structure of gray iron, and new developments.

Gray iron is one of our oldest engineering materials, and is second only to steel in the use of metals by industry today. A constant development and research program has kept the gray iron industry searching for a better and better product for use by the public. The percentage increase in the use of gray iron castings over the past five years exceeded that of nonferrous castings and also of welded structures (which can be used in much the same way as gray iron castings).

Some of the advantages gray iron has over other engineering materials are its excellent vibration absorption properties; good lubrication properties; high resistance to tapwater corrosion; a compressive strength about three times as great as its tensile strength; a response to heat treatment similar to eutectoid steel; and excellent machining properties. Gray iron has one noticeable limitation—it will not take any appreciable plastic deformation.

New possibilities of coating or welding castings are only beginning to be appreciated. The metallizing process, for example, can be used to apply a stainless steel coating to gray iron castings, and a new hot dip process has been developed for coating with aluminum.

The basic cupola is now being used for making gray iron in a number of foundries, particularly when pig irons with higher than normal sulphur and phosphorus contents must be utilized. The carbide injection system, in which calcium carbide is blown directly into molten iron, has been developed to help remove sulphur and phosphorus contents must stage but promises to endow gray iron with higher strength and to minimize section sensitivity.

Gray iron offers advantages over other cast materials because of its high fluidity, e.g. molten iron has more "life" at low casting temperatures than any other ferrous material. The liquid-to-solid shrinkage coefficient is the lowest of the ferrous materials used for castings and the contraction on solidification is small, giving lower casting stresses at room temperature. As is true of all casting processses, gray iron is particularly suitable to the quantity production of articles.

The use of alloy cast iron has rapidly expanded in recent years. Specifications, however, are still largely based on tensile strength. Gray iron used as bearing backs for railway cars has been found superior to bronze. Shell molding is being increasingly used, and gives a better surface with less sand handling and closer casting tolerances.

These are only a few of the new developments in the gray iron industry in the past several years, and more fundamental and revolutionary programs are under way.

# Roberts Gives Talk On Powder Metallurgy

Reported by James M. Benbow

The November meeting of the Indianapolis Chapter featured Arthur E. Focke and George A. Roberts as guests at National Officers Night. Dr. Focke, A.S.M. past president, represented Secretary Eisenman at the meeting.

Dr. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., spoke on "Pre-Alloyed Steel Powder Metallurgy". He first described the method used to produce the various prealloyed powders. In this process a stream of molten metal of the desired alloy composition falls into a water spray from a revolving head. Small droplets of molten metal solidify, producing the alloyed powder. This method is used to produce steel powders whose compositions conform to A.I.S.I. analyses.

Dr. Roberts then discussed the operations used in producing parts by powder metallurgy, and the effects of variables such as density, pressure and sintering temperature on the properties of the sinterings. The tensile properties of the sinterings increase with the density until they are equal to the properties of the wrought material at densities equal to the wrought material.

In comparing the properties of iron sinterings and those of stainless steel, the stainless steel alloys were shown to possess higher tensile strength and better ductility. The most popular analyses of stainless steel at the present time are Types 302 B, 316, 318, and 431. In general, the straight chromium types are not satisfactory. The A.I.S.I. 4600 series of steels has been the most popular in the low-alloy group.

In concluding, Dr. Roberts reviewed possible future developments in the field and stated that powdered metal parts can be made with properties equal to or better than the properties of wrought materials.

### Adds New Plant

Powdered Metal Products Corp. of America, Franklin Park, Ill., has announced the beginning of construction work on a new plant addition at the company's Franklin Park location to expand production facilities by 40%. The firm is a recognized fabricator of powdered metal gears, bearings and other component parts, and pioneered recently in the development of production facilities in connection with the new shell molding process for precision casting.

### Die Casting Award Entries Open

The American Die Casting Institute has announced that nominations or entries for the annual Doehler Award are now being solicited. Nominations will be received until April 30.

The award is made annually for outstanding contributions to the advancement of the die-casting industry or to the art of die casting, as represented by technical achievement, advancements in plant operations, or other activities in this field. Any individual, group of individuals, technical or scientific society or committee is eligible for the award, which consists of a suitable plaque and a cash honorarium of at least $500.

Entries should be addressed to the Award Committee, American Die Casting Institute, 366 Madison Ave., New York 17, N. Y.

## IMPORTANT MEETINGS *for March*

**Mar. 2-6—American Society for Testing Materials.** Spring Meeting and Committee Week. Symposium on Gloss Measurement. Statler Hotel, Detroit. (R. J. Painter, Assistant Secretary, A.S.T.M., 1916 Race St., Philadelphia 3, Pa.)

**Mar. 16-20—National Association of Corrosion Engineers.** Symposium on Protective Coatings. Chicago, Ill. (A. B. Campbell, Executive Secretary, N.A.C.E., 919 Milam Bldg., Houston 2, Texas).

**Mar. 17-20—American Society of Tool Engineers.** Annual Meeting. Statler Hotel, Detroit, Mich. (Harry E. Conrad, Executive Secretary, A.S.T.E., 10700 Puritan Ave., Detroit 21, Mich.)

**Mar. 19-21—Optical Society of America.** Spring Meeting. Hotel Statler, New York City. (Arthur C. Hardy, Secretary, O.S.A., Massachusetts Institute of Technology, Cambridge 39, Mass.)

**Mar. 25-27—Pressed Metal Institute.** Fourth Spring Technical Meeting, Hotel Carter, Cleveland, Ohio. (E. M. Ross, P. M. I., 13210 Shaker Square, Cleveland 20, Ohio)

**Mar. 31-Apr. 2—Magnesium Association.** International Magnesium Exposition, Washington National Guard Armory, Washington, D. C. (Martha I. Hansen, Assistant Secretary, M. A., 122 East 42nd St., New York 17, N. Y.)

# *Second Northwest Circuit Talk—*

## *Designing to Prevent Corrosion*

Reported by H. L. Southworth
*Boeing Airplane Co.*

Robert B. Mears, manager of the research and development laboratories of United States Steel Corp., discussed the subject "Designing to Prevent Corrosion" before a joint meeting of the Puget Sound and the Western Washington Chapters of the American Society for Metals and the American Society of Mechanical Engineers.

Dr. Mears called attention to the fact that plant site selection is a very important, and the difference of to prevent corrosion. Such a seemingly minor consideration as the direction of prevailing winds may be very important, and the difference of a few hundred yards in the location of a plant may result in a large difference in the corrosive conditions encountered, particularly when industrial and marine atmospheres are considered.

Material selection has perhaps received the most thought in designing to minimize product corrosion. This subject is also important in plant design but in both cases other design considerations must be recognized. For example, many items of equipment have been made with the best materials to handle or store a substance considered corrosive. Some of these have been short-lived, however, because the design has permitted stagnant accumulations that resulted in failure, or because insufficient attention was given to external corrosive conditions.

Dr. Mears emphasized that most available information concerning the behavior of materials subject to corrosion is empirical knowledge and the designer must have data on the performance of materials under the specific conditions of service expected in order to choose the best material and be able to predict its behavior. It has been found that curves in which resistance to attack is plotted against change in composition of the material or against change in composition of corrosive medium in contact with a specific material, sometimes have unpredictable, large changes of slope.

Many interesting examples of severe and expensive corrosive attack were shown on slides. In each case, Dr. Mears pointed out the very minor changes in physical design that would have prevented such catastrophic failures. The most important condition to avoid is the presence of undrained pockets which permit accumulations of corrosive substances with the subsequent evaporation, concentration and perforation.

Dr. Mears concluded his talk with a discussion of the importance of protective coatings such as paints in delaying the start of corrosive attack and the role of stresses in accelerating attack.

*Dr. Robert B. Mears (Left) the Second Speaker on the Northwestern Circuit Is Shown as He Chats With Ted Thiess, Vice-Chairman, and Walter Prior, Chapter Chairman, When He Spoke Before the Oregon Chapter in October*

# Explains Radioactive Means of Determining Tool Life and Wear

Reported by D. F. Gerstle
*General Processes-Delco Products*

Since in any specific machining operation the rate of tool wear is constant, it is possible to use radioactive tools as a means of quickly determining tool life. The radioactivity of the chips is a direct indication of tool wear, according to M. E. Merchant, assistant director of research, Cincinnati Milling Machine Co. who spoke at the November meeting of the Dayton Chapter on "Metal Cutting Fundamentals". Dr. Merchant's talk appropriately climaxed that part of the Dayton Chapter's educational program on "Machining of Metals".

Dr. Merchant very clearly and interestingly analyzed the machining process. Shearing of the metal to form the chip and movement of the chip up the face of the tool cause heat and abrasion which lead to tool failure.

When the strength of the metal being machined is high, greater force is required to do the machining and more heat is produced. More heat is produced the larger the area of shear or the smaller the angle of shear. When the chip peels back rapidly there is less area of the tool to pull the heat away, with the result that a small area is exposed to all the heat.

Three types of chips were illustrated; namely, the discontinuous chip formed when the metal cannot undergo the required amount of shear without rupturing, the continuous chip, and the "built-up edge" type. High frictional resistance encountered as the chip moves up the face of the tool causes some of the metal to shear away from the body of the chip and cling to the tool.

In all types of machining—milling, broaching, drilling and even grinding—the fundamentals are the same.

Cutting fluids act as coolants to remove heat and serve as a means of reducing friction. When the cutting fluid contains sulphur or chlorine it forms compounds with the chip in the presence of the high temperatures existing at the points of contact between the chips and tool. These compounds interfere with the chip bonding to the tool. With a weak junction less friction is produced when the bond is broken.

Dr. Merchant used titanium as an example in illustrating machining fundamentals. The remarkable fact that titanium is difficult to machine because the metal alloys with the tool was brought out. Cast iron was also used as an example. The meeting closed with the showing of moving pictures of the machining of steel.

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### Colorado Fuel Expands

The Colorado Fuel & Iron Corp. has arranged for the purchase of John A. Roebling's Sons Co. The new acquisition will be operated as a subsidiary under the Roebling name.

Charles R. Tyson, president of Roebling since 1944, will continue as top operating executive.

# Rocket Expert Predicts Trip to Mars

*In an Address Before the Boston Chapter in November, Walter R. Dornberger (Center) Gave Some Interesting Highlights in the Development of "Guided Missiles". Shown at the speakers table are, from left: Sydney Baylor, program chairman; R. C. Seamans, Jr., technical chairman; Dr. Dornberger; William Badger, chapter chairman; and G. K. Megerian, coffee speaker*

Reported by William F. Collins
***Carr Fastener Co. Division***

Walter Dornberger, consultant at Bell Aircraft Co., spoke to more than 300 members and guests at the November meeting of the Boston chapter, on "Guided Missiles, Past, Present, and Future."

Dr. Dornberger stated that according to military definition, a guided missile is a technical device driven by reaction forces and fired or launched against a target. It is unpiloted, fully automatic, and guided by remote control or by guidance instruments inside the missile structure. Therefore, the main characteristics of a guided missile are: (*a*) no pilot; and (*b*) driven by reaction forces produced by a turbojet, ramjet, or rocket engine.

In a rocket system gas molecules are ejected from a nozzle at very high speeds—in the V-2 rockets, 270 lb. of fuel per sec. is ejected in the form of gas molecules, with an average exhaust velocity of about 7000 ft. per sec. This, due to its reaction, causes the 26,000 lb. gross weight of the rocket to take off. No air, water, or ground-supporting medium is necessary to get a rocket system working. It is independent of its surroundings; thus, reaction forces or rocket power seem at the present time to be the only means of travel in free space.

Rocket propulsion is not an invention of modern times. For centuries men have used the reaction principle to build weapons. Even though these rocket-powered missiles were small and primitive, they were the forerunners of the power plants used in our present-day rockets.

Prior to the last war many engineers throughout the world were working on a rocket development program but all were handicapped because of the lack of money. In the spring of 1930 the German Ordnance Department started looking into the possibilities of rockets as weapons. Four German scientists (one of whom was Dr. Dornberger) were responsible for the development of the V-2 rocket or guided missile that we know today. In the spring of 1935 they selected a small island in the Baltic Sea called Peenemuende as a development center where they built and fired A-3, A-4, and A-5 rockets.

It was a trial and error program with numerous obstacles to overcome, but with many men working toward a common goal, the V-2 rocket was perfected. This rocket carried 650 lb. of explosives and was the cause of much devastation in England during World War II. From a military standpoint the rocket came too late to have any decisive consequences in the outcome of the war, but despite its shortcomings it showed what might be accomplished with this type of weapon. As the development of guided missiles continues it could well be the cause of scrapping bombers if the concept of much higher altitudes is the goal.

Dr. Dornberger cited the extensive research going on in this field throughout the world today and told how rockets could be used not only as an instrument of war but as a means of space traveling in the future. In traveling through space there is no air resistance or drag, thereby shortening the distance around the globe. A business man will be able to leave New York in the morning, travel to London, transact his business and be back in New York for lunch. To the average person the thought of space traveling seems fantastic, but Dr. Dornberger feels that in the not too distant future a trip around the moon and stars could be entirely feasible. Dr. Dornberger estimates the cost of building artificial satellites and space ships plus other necessities would be about $10,000,000,000. With this huge sum as a stumbling block it may be many years before we spend a vacation on Mars.

# THIRTY YEARS AGO

HOWARD SCOTT, then associate physicist of the National Bureau of Standards (now manager of the metallurgical and ceramics department, research laboratory, Westinghouse Electric Corp.), presented the evening lecture on high-temperature quenching.

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The second day of the Chicago regional meeting was devoted to a meeting of the board of directors and plant inspection trips to Wyman-Gordon Co., Interstate Iron & Steel Co., and Illinois Steel Co.

—30—

The column headed "Items of Interest" in the March 1923 issue of the *Transactions* reveals that: "The Atlas Steel Corp., Dunkirk, N. Y., announces the establishment of a research division of its metallurgical department. The research division is to be under the direction of EDGAR C. BAIN, who has been research metallurgist at the Cleveland Wire Div. of the General Electric Co. and retains contact with them in a consulting capacity. Mr. Bain has done much pioneer work in the X-ray spectrographic study of the crystal structure of metals. . ." (Dr. Bain, A.S.M. president in 1937, is now vice-president in charge of research for United States Steel Corp.)

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HENRY T. CHANDLER, according to an announcement in the same issue, "formerly associated with C. Harold Wills & Co. as meallurgical engineer, has become associated with the Vanadium Corp. of America, Detroit office". (Mr. Chandler is now a vice-president of the Vanadium Corp.; for further details of his early career, see *Metal Progress* for September 1952, page 91.)

## Extension Course on Marketing Principles

Thirty salesmen and executives of the Benedict Miller Steel Co. have just completed a series of four all-day sessions at the plant on industrial marketing of steel products. During the course, conducted by the Rutgers University Extension Divison, the Benedict Miller representatives concentrated upon marketing principles, servicing the customer, distribution, and warehouse techniques, as well as the personal qualities of a good salesman.

In addition to six lectures on various aspects of marketing by qualified executives and professors, specific steel industry marketing questions were discussed by John F. Tyrrell of the American Society for Metals and a member of the business staff of *Metal Progress*.

## Gives New Aspects of Tool and Die Heat Treatment

Reported by John M. Turbitt

*Sales Engineer*
*Metal Goods Corp.*

Edward J. Pavesic of the Lindberg Steel Treating Co. spoke before the North Texas Chapter in November on "Practical Aspects of Tool and Die Heat Treatment".

Mr. Pavesic explained that in recent years tool and die heat treatment has been established as more or less of an exact science. This may be attributed to a general increase in the knowledge and improvements in techniques related to the manufacture of toolsteels, the development and more widespread use of improved heat treating equipment, and greater knowledge concerning the properties of various classes of toolsteels. The result is that the widely varied uses of tools and dies are more sound, and a greater understanding exists among tool designers and engineers of the part that design of the tool or die plays in heat treatment and subsequent service performance. Furthermore, the metallurgical principles are better understood.

Among other problems discussed were those dealing with overheating in forging which increases susceptibility to cracking in heat treatment, and the causes of excessive growth, shrinkage and distortion.

Mr. Pavesic emphasized the necessity of avoiding decarburization during heat treament by the use of controlled atmospheres and/or neutral salt baths. Minimum hardening temperatures and times were suggested as means of minimizing distortion, grain growth and susceptibility to cracking.

The speaker stated that a movement has been started by manufacturers and consumers of toolsteels to standardize analyses. This standardization is being carried out by the so-called Joint Industry Conferences (J.I.C.).

Mr. Pavesic used numerous slides to depict actual cases wherein better tools and dies could be produced if proper selection of steel is made, design is sound, and proper heat treating technique is used.

## Selecting and Applying Steels Discussed at York

Reported by D. G. Livingston

*Hill-Chase & Co.*

Arnold Seasholtz, head of the Seasholtz Metallurgical Service, addressed the December meeting of the York Chapter on the "Selection and Application of Steels", basing his findings on hardenability.

The difference in hardening capacity between different types of steels was illustrated and their behavior over a wide range of sizes in different quenching media was explained. In addition, the speaker reviewed problems encountered in commercial heat treating resulting from poor material application.

## *New Films*

**History of Forging**

Five thousand years of progress in forging metal are shown in a 20-min. sound film produced for Utica Drop Forge & Tool Corp. Months of research were required to obtain data, verify and script the story which traces the use of pliers and wrenches through the centuries. Three-dimensional, activated dioramas show ancient methods of smelting and forging to make metal products.

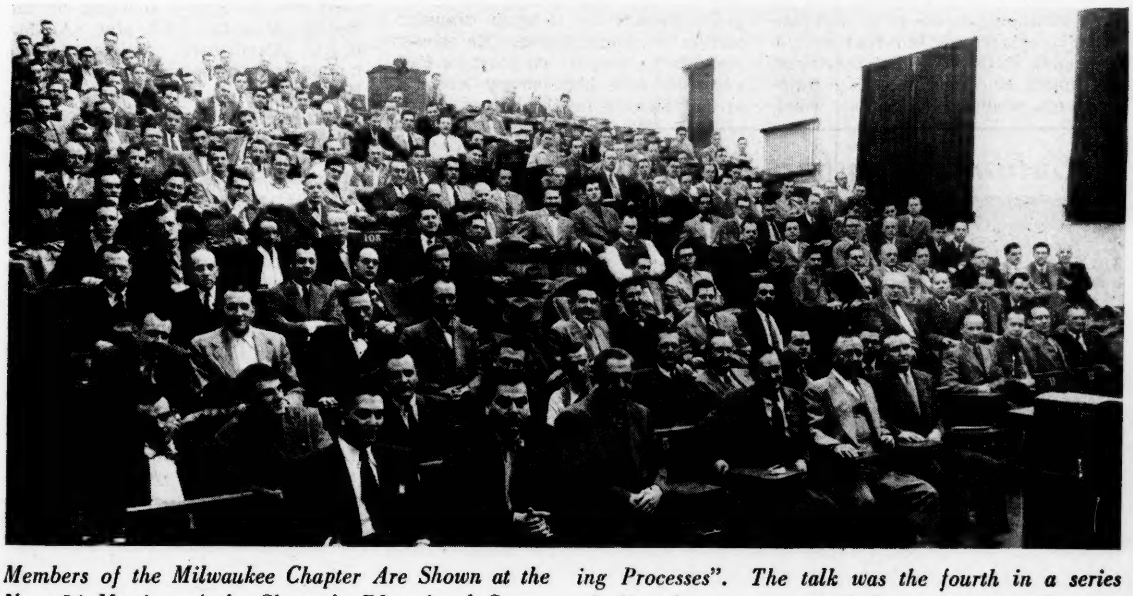
Information on the film may be obtained by writing directly to Utica Drop Forge & Tool Corp., Utica 4, N. Y.

## Student Invites South American Commissions

Gerald X. Diamond, who will graduate from the University of Cincinnati in June 1953 with a degree in metallurgical engineering, is planning a trip to Colombia, South America. He will visit industries in the principal cities along his route of travel, with special emphasis on those engaged in metallurgical processing, and will study educational and industrial facilities in Colombia.

Mr. Diamond invites any A.S.M. members who wish to make contacts in South America, or who wish notes, programs or other material delivered there, to contact him before June at 633 Forest Ave., Cincinnati 29, Ohio.

## *Full House at Milwaukee's Lecture Course*



*Members of the Milwaukee Chapter Are Shown at the Nov. 24 Meeting of the Chapter's Educational Course Which Featured N. O. Kates, Metallurgist, Lindberg Steel Treating Co., Who Spoke on "Special Heat Treating Processes". The talk was the fourth in a series of five lectures presented by various speakers on "A Practical Approach to Metallurgical Problems". (Photograph by M. A. Wallesz, Globe Steel Tubes Co.)*

## Development of the Cold Extrusion Process Traced by deVore

Reported by A. A. Bradd
*Roll Engineer, Midvale Co.*

"How to Make Cold Steel Flow" was explained by Weber deVore of the Heintz Manufacturing Co., before the Temple University Night meeting of the Philadelphia Chapter.

Mr. deVore, manager of the Ordnance Division of his company, traced the development of the cold extrusion process from the work done in Germany during the 1930's to the present practice in the United States, where cold extrusion is saving time and material, replacing heat treatment, and producing parts made of straight carbon steel with physical properties normally associated with heat treated alloy steels.

Successful cold extrusion requires a very adherent, flexible, heat resistant coating that withstands the high pressures applied during the process and prevents metal-to-metal contact between the work being extruded and the die. The coatings in current use are of the phosphate type and are the result of extensive modification of the German practice. The coatings can be applied by dipping or spraying.

As an example of the savings in material, fabricating, machining and heat treatment possible with cold extrusion, Mr. deVore described the manufacture of a 75-mm shell. When made conventionally, a 22.6-lb. forging requiring 25 separate machining operations and heat treatment is required to produce a 10.75-lb. shell. When cold extruded, this shell is made from a slug weighing 11.3 lb. The extrusion process is so accurate that it replaces all but four of the machining steps. No heat treatment is required since the necessary properties are produced by the cold working operations. Cold extruded parts have very smooth surfaces, and wall thicknesses of the order of $\pm$ 0.01 in. are not difficult.

Most parts made by cold extrusion have been for ordnance. Recently, however, a number of commercial bodies have been manufactured by this process because of the savings of material made possible over the conventional machining methods.

The largest parts made by cold extrusion so far have been 155-mm. shells. The limiting factors are the strength of the dies and the power of the presses available.

Annealed ingot iron with a tensile strength of 42,000 psi. can be cold extruded to have 115,000 psi. strength, and 145,000 is obtained with S.A.E. 1020, thus replacing heat treated alloy steels. Even higher strength levels can be obtained with other steels.

Mr. deVore said his company was willing to furnish information to any company in this country interested in undertaking such a cold extrusion program.

## Poses Question—Is Atomic Power a Tool Or a Weapon?

Reported by Willard Roth
*Westinghouse Electric Corp.*

Jerry De Croce of the Westinghouse Electric Corp. spoke before the Northwestern Pennsylvania Chapter in November on "Atomic Energy —Tool or Weapon".

Mr. De Croce introduced his subject with a comparison of the hydrogen-to-helium or H-bomb transformation to atomic fission. He showed how the former, which must be triggered by such high-energy levels as are attainable in the latter, is inherently explosive and cannot therefore be applied to known constructive purposes. On the other hand, the energy released in fission is controllable and can be harnessed to useful purposes.

With this preface, Mr. De Croce retraced the research work which led to fission, the chain reaction, and the A-bomb. He described postwar work on atomic power, citing the work being done on propulsion units for submarines and surface ships, and on stationary power plants.

Mr. De Croce sketched a possible power plant in which there would be a primary and a secondary atomic pile. The former would be used primarily for the production of fissionable materials; the latter for electric power. The secondary pile would be a byproduct of the primary pile. Other byproducts of these piles are the radioactive tracers used in medicine and biochemistry.

Mr. De Croce also stated some secondary benefits industry has derived from the work at Oak Ridge. Among these are the developments of leakproof pumps for corrosive acids, hermetic welding, portable spectrographs, and diffusion devices.

The talk ended with the thought that peacetime uses of atomic power and its byproducts will ultimately outweigh its destructive uses.

## *Calumet Members at Toolsteel Plant*

*Members of the Calumet Chapter of the American Society for Metals Visited the Columbia Tool Steel Co., Chicago Heights, Ill., During an Open House Held in November. The group made a two-hour conducted tour of the plant where they were shown the various steps necessary in the manufacture of quality toolsteel. Refreshments were served after the tour*

## Outlines Properties And Uses of Hard-Facing Materials

Reported by Clyde O. Penney
*Metallurgist*
*Denver & Rio Grande Western R.R.*

At the November meeting of the Rocky Mountain Chapter A.S.M., R. C. Carruthers, assistant sales manager of the welding products section of the American Manganese Steel Division, American Brake Shoe Co., presented a talk on the "Selection and Properties of Hard-Facing Materials".

Mr. Carruthers described the advantages of hard-facing materials from the standpoint of wear resistance, ease of use and application, economy, and savings involved in their use.

He described and presented the results of various tests for various types of wear such as impact, gouging abrasion, grinding abrasion, erosion, galling, oxidation and corrosion. The advantages and disadvantages of various means of application such as arc welding and gas welding for several classifications of hard-facing materials were discussed by the speaker, with special attention directed to tungsten carbide composites and high-chromium irons. Many excellent micrographs were shown which illustrated the structure of various hard-facing materials.

## Rapid Growth of Extrusion Process Explained by Speaker

Reported by Eugene M. Smith
*Development Engineer*
*Youngstown Sheet and Tube Co.*

The Mahoning Valley Chapter heard T. F. McCormick, Aluminum Co. of America, speak on "Extrusion of Aluminum and Aluminum Alloys" at the November meeting.

Mr. McCormick's discussion of extrusion covered the period from the days of its founder, Alexander Dick, in 1894, up through future developments.

Far more aluminum is extruded, in tonnage, than other extrudable materials, such as copper, lead, tin, zinc and magnesium. Extrusion presses range in size from 200 to 13,200 tons at the present time. The 2500-ton press appears to be the most versatile with respect to production of aircraft materials. There are only two 13,200-ton presses in existence at the present time (both built in Germany), but a number of very large presses have been planned or are being constructed.

With the contemplated growth in size of modern aircraft, even larger presses (up to 20,000 tons) are being designed to permit the extrusion of larger and longer wing spars and other aircraft parts.

Essentially, the range of product shape is limited only by the imagination and ingenuity of the designer. The minimum thickness extruded in aluminum is generally 1/16 in., but there can be many exceptions. Dimensional tolerances are continually being decreased.

Temperature, pressure and speed of extrusion are the major controllable interrelated variables for producing good quality extruded sections at an economical rate of production. To control temperature, tapered heating of ingots, water cooling of dies and close control of container temperature have been used with success. Extrusion speeds range from less than 1 to over 300 ft. per min, depending upon the type of alloy. Greater speeds are limited by the inability to remove the extrusions rapidly from the press area.

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### New Precision Casting Plant

The Whitehall Precision Casting Division of Michigan Steel Casting Co. was opened in September in Whitehall, Mich. The new plant is designed for efficient straight-line production of precision castings, and will supplement MISCO's Detroit operations.

## *Educational Series Features Knowlton*

*Members of the Chicago Chapter's Educational Committee, Who Have Just Completed a Series of Educational Lectures on "Fundamentals and Practical Aspects of Hardenability" Are, From Left: E. Roff, U. S. Steel Corp., Chapter Chairman; C. W. Saenger, Illinois Tool Works; W. H. Winwurm, Union Special Machine Co., Educational Chairman; Harry B. Knowlton, International Harvester Co., Speaker; Fred Kisslinger, Illinois Institute of Technology; and Edward J. Pavesic, Lindberg Steel Treating Co.*

Reported by Braly S. Myers
*Manufacturing Research*
*International Harvester Co.*

The Chicago Educational Series this past fall was a concentrated course consisting of four integrated lectures on "The Fundamentals and Practical Aspects of Hardenability".

Harry B. Knowlton, chief engineer, materials engineering, International Harvester Co., and A.S.M. National Trustee, was the speaker. He is an outstanding authority on the subject and is well known for his fundamental approach to metallurgical problems. He is one of the very few men, if not the only one, who has been chairman of three different A.S.M. chapters—Ft. Wayne, Milwaukee, and Chicago.

This series of lectures was dedicated to the memory of the late Marcus A. Grossmann for his excellent work on hardenability. The material covered in the lectures was drawn from Dr. Grossmann's book "Elements of Hardenability", along with other more recent material compiled by the speaker.

The first lecture was confined to historical background of hardenability, definition and fundamentals of hardenability and hardenability tests. The second lecture included the nature of hardening, nature of quenching, S-curves and D.I. values.

The third session was devoted to a discussion of the effects of alloying elements on hardenability, also the multiplying factors for different elements based on Grossmann's graphs and others. Mr. Knowlton gave a resume of recent work on high-carbon steels, particularly the use of induction hardened plain carbon steel gears where the more expensive alloy steel was formerly considered a necessity.

On the fourth and last night of the series the speaker put hardenability to work. He explained the practical uses of hardenability data, the important part it played in formulating the NE steels during World War II, and the H-band steels which are based on hardenability, thus giving greater latitude to chemical composition. Mr. Knowlton also elaborated on boron steels, and told how instrumental they have been in conserving critical alloying elements essential to jet engine metal and other national defense requirements.

Three hundred and forty-seven men and women signed up for this course. Each person received a copy of Dr. Grossmann's book, and certificates were issued to those who completed the series satisfactorily. Attendance was the largest in Chicago Educational Series' 30 years of existence. This is attributed to having an outstanding speaker, a good subject, a text being furnished, and a nominal fee, as well as to the good publicity obtained for the course by the Educational Committee.

### *Ten Years Ago*

**Quotes From *Metals Review* January 1943**

"Wichita, Kan., and San Diego, Calif., are the locations of the two latest chapters to be welcomed into the fold by the American Society for Metals . . . Organization of two other chapters in Spokane, Wash., and Warren, Ohio, will be completed shortly."

—10—

"A major metallurgy teaching and research program [is] to be launched by the University of Rochester in cooperation with industry. Local industrial plants have provided $100,000 in cash and equipment, of which the Rochester Chapter of A.S.M. has contributed $1000. The program will be . . . under the direction of Prof. WILLIAM J. CONLEY, acting chairman of the department of engineering at the University."

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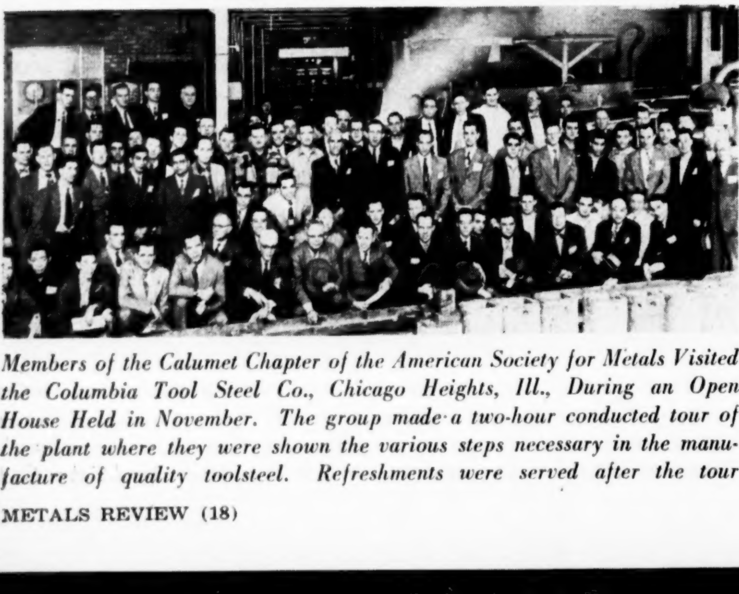

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The Whitehall Precision Casting Division of Michigan Steel Casting Co. was opened in September in Whitehall, Mich. The new plant is designed for efficient straight-line production of precision castings, and will supplement MISCO's Detroit operations.

## *Educational Series Features Knowlton*

*Members of the Chicago Chapter's Educational Committee, Who Have Just Completed a Series of Educational Lectures on "Fundamentals and Practical Aspects of Hardenability" Are, From Left: E. Roff, U. S. Steel Corp., Chapter Chairman; C. W. Saenger, Illinois Tool Works; W. H. Winwurm, Union Special Machine Co., Educational Chairman; Harry B. Knowlton, International Harvester Co., Speaker; Fred Kisslinger, Illinois Institute of Technology; and Edward J. Paresic, Lindberg Steel Treating Co.*

Reported by Braly S. Myers
*Manufacturing Research*
*International Harvester Co.*

The Chicago Educational Series this past fall was a concentrated course consisting of four integrated lectures on "The Fundamentals and Practical Aspects of Hardenability".

Harry B. Knowlton, chief engineer, materials engineering, International Harvester Co., and A.S.M. National Trustee, was the speaker. He is an outstanding authority on the subject and is well known for his fundamental approach to metallurgical problems. He is one of the very few men, if not the only one, who has been chairman of three different A.S.M. chapters—Ft. Wayne, Milwaukee, and Chicago.

This series of lectures was dedicated to the memory of the late Marcus A. Grossmann for his excellent work on hardenability. The material covered in the lectures was drawn from Dr. Grossmann's book "Elements of Hardenability", along with other more recent material compiled by the speaker.

The first lecture was confined to historical background of hardenability, definition and fundamentals of hardenability and hardenability tests. The second lecture included the nature of hardening, nature of quenching, S-curves and D.I. values.

The third session was devoted to a discussion of the effects of alloying elements on hardenability, also the multiplying factors for different elements based on Grossmann's graphs and others. Mr. Knowlton gave a resume of recent work on high-carbon steels, particularly the use of induction hardened plain carbon steel gears where the more expensive alloy steel was formerly considered a necessity.

On the fourth and last night of the series the speaker put hardenability to work. He explained the practical uses of hardenability data, the important part it played in formulating the NE steels during World War II, and the H-band steels which are based on hardenability, thus giving greater latitude to chemical composition. Mr. Knowlton also elaborated on boron steels, and told how instrumental they have been in conserving critical alloying elements essential to jet engine metal and other national defense requirements.

Three hundred and forty-seven men and women signed up for this course. Each person received a copy of Dr. Grossmann's book, and certificates were issued to those who completed the series satisfactorily. Attendance was the largest in Chicago Educational Series' 30 years of existence. This is attributed to having an outstanding speaker, a good subject, a text being furnished, and a nominal fee, as well as to the good publicity obtained for the course by the Educational Committee.

### *Ten Years Ago*

**Quotes From *Metals Review* January 1943**

"Wichita, Kan., and San Diego, Calif., are the locations of the two latest chapters to be welcomed into the fold by the American Society for Metals . . . Organization of two other chapters in Spokane, Wash., and Warren, Ohio, will be completed shortly."

—10—

"A major metallurgy teaching and research program [is] to be launched by the University of Rochester in cooperation with industry. Local industrial plants have provided $100,000 in cash and equipment, of which the Rochester Chapter of A.S.M. has contributed $1000. The program will be . . . under the direction of Prof. WILLIAM J. CONLEY, acting chairman of the department of engineering at the University."

# CHAPTER MEETING CALENDAR

| CHAPTER | DATE | PLACE | SPEAKER | SUBJECT |
|---|---|---|---|---|
| Baltimore | Mar. 16 | Engineers Club | H. S. Avery | Abrasive Resistant Alloys |
| Boston | Mar. 6 | Hotel Shelton | | Armed Forces Night |
| British Columbia | Mar. 9 | Stanley Park | R. L. Wilson | |
| Buffalo | Mar. 12 | Sheraton Hotel | H. C. Cross | Behavior of Metals at High Temperatures |
| Calumet | Mar. 10 | Phil Smidt | D. J. Carney | Behavior of Gases in Liquid Iron and Steel |
| Canton-Massillon | Mar. 3 | | Panel Discussion | Heat Treating |
| Carolinas | Mar. 19 | Charlotte, N. C. | J. P. Clark, Jr. | Molten Salt, Baths and Practical Heat Treatment |
| Chicago | Mar. 9 | Furniture Mart | R. H. Heyer | Cold Forming and Deep Drawing of Iron and Steel Sheets |
| Cincinnati | Mar. 12 | Eng. Soc. Hqd. | Eugene Merchant | Machining |
| Cleveland | Mar. 2 | Hollenden Hotel | W. E. Sicha | Aluminum Alloys |
| Columbia Basin | Mar. 5 | Richland Public Library | R. L. Wilson | |
| Columbus | Mar. 4 | Broad St. Church | D. I. Brown | Iron Ore |
| Dayton | Mar. 11 | | | Plant Visit |
| Detroit | Mar. 9 | Rackham Bldg. | S. O. Evans | Extrusion of Steel |
| Eastern New York | Mar. 14 | | | Magnetic Materials and Their Applciations |
| Georgia | Mar. 2 | Atlantic Steel Co. | | Nondestructive Testing Techniques |
| Hartford | Mar. 10 | The Hedges | J. K. Boll | Deep Drawing Carbon and Stainless Steels |
| Indianapolis | Mar. 16 | McClarneys Rest. | W. H. Holcroft | Gas Carburizing |
| Inland Empire | Mar. 3 | Spokane Hotel | | National Officers Night |
| Lehigh Valley | Mar. 6 | Hotel Traylor, Allentown | L. P. Tarasov | Metallurgical Aspects of Grinding Hardened Steel |
| Los Alamos | Mar. 19 | | J. B. Austin | Magnification in Time |
| Los Angeles | Mar. 19 | Rodger Young Auditorium | R. L. Wilson | Current Developments in Alloy Constructional Steels |
| Louisville | Mar. 3 | Korfhage's Tavern | | |
| Mahoning Valley | Mar. 10 | Post Room, V.F.W. | J. E. Phillips | Physical Properties of Cold Rolled Carbon Steel Strip |
| Milwaukee | Mar. 17 | City Club | T. W. Lippert | Tomorrow's Metal Today: Titanium |
| Minnesota | Mar. 19 | Covered Wagon | J. A. Nock, Jr. | Properties and Heat Treatment of Aluminum Alloys |
| Montreal | Mar. 2 | Queens Hotel | O. Horger | Why Metals Fracture |
| | Mar. 13 | Mt. Royal Hotel | | Annual Stag |
| New Haven | Mar. 19 | Hotel Barnum, Bridgeport | R. F. Miller | New Trends in Developments of Alloy Steels |
| New Jersey | Mar. 16 | Essex House Hotel | Panel Discussion | Practical Metallurgical and Heat Treatment Control |
| New York | Mar. 9 | Schwartz's Rest. | E. M. MacCutcheon | Low-Temperature Properties of Metals |
| Northwestern Pennsylvania | Mar. 26 | Meadville | R. L. Chenauh<br>G. E. Mohnkern | Pressure Nitriding |
| Notre Dame | Mar. 11 | Eng. Bldg. | H. E. Shepard | Design, Development and Application of Die Castings |
| Oak Ridge | Mar. 18 | K. of C. Hall | R. H. Thielemann | Aircraft Gas Turbine Materials |
| Ontario | Mar. 6 | King Edward Hotel | | Ladies' Night |
| Oregon | Mar. 13 | Phys. Met. Res. Lab. | H. R. Footit | Why Metals Fracture |
| Ottawa Valley | Mar. 3 | Congress Hotel | R. L. Wilson | Current Developments in Alloy Constructional Steel |
| Penn State | Mar. 10 | State College | A. J. Shaler | Flow of Metal Powders and Sand During Compaction |
| Philadelphia | Mar. 27 | Franklin Institute | J. Winlock | Influence of Microstructure and Rate of Deformation on the Tensile Properties of Medium Carbon Steel (Sauveur Night) |
| Pittsburgh | Mar. 12 | Roosevelt Hotel | C. F. Nagel, Jr. | Young Fellows' Night |
| Purdue | Mar. 17 | Purdue Union | L. E. Richardson | Latest Advances in Tool and Die Salvage |
| Rhode Island | Mar. 4 | Eng. Soc. Bldg. | | Heat Treating |
| Rochester | Mar. 9 | Howard Johnson's | F. W. Boulger | Machinability |
| Rockford | Mar. 25 | Faust Hotel | | Classification and Application of Refractory |
| Rocky Mt. Pueblo Group | Mar. 19 | Minnequa Club | W. E. Remmers | Uranium in Colorado |
| Saginaw Valley | Mar. 17 | Frankenmuth | R. F. Mehl | Metallurgical Research and the Nation |
| Springfield | Mar. 16 | Ivy House | F. K. Bloom | New Types of Stainless Steels |
| St. Louis | Mar. 20 | Forest Park Hotel | R. L. Nelson | Hot Forming and Fabrication of Magnesium |
| Syracuse | Mar. 3 | Onondaga Hotel | A. E. Martin | Die Castings |
| Texas | Mar. 3 | Ben Milam Hotel | F. L. LaQue | Some Effects of Heat Treatment of Metals in Resisting Corrosion |

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|---|---|---|---|---|
| Toledo | Mar. 12 | Maumee Yacht Club | E. Erickson, S. Spring | Cold Extrusion |
| Tri-City | Mar. 3 | Rock Island Arsenal | E. J. Pavesic | Practical Heat Treatment |
| Tulsa | Mar. 3 | | H. Brown | Difficulties in Fabricating Stainless Steels and High-Temperature Alloys |
| Utah | Apr. 2 | Newhouse Hotel | J. B. Austin | Metals of Tomorrw |
| Warren | Mar. 12 | El Rio | N. F. Tisdale, Jr. | Rare Earth Materials in Iron and Steel |
| Washington | Mar. 9 | Naylor's Rest. | P. H. Blewitt | Effect of Neutron Irradiation on Properties of Copper Single Crystals |
| West Michigan | Mar. 16 | Elks' Club, Grand Rapids | | Ladies' Night |
| Wichita | Mar. 27 | K. of C. Hall | H. Becker | Lead-Tin Alloys, Solders and Soldering |
| Worcester | Mar. 11 | Hickory House | J. H. Moore | Vacuum Metallurgy |
| York | Mar. 11 | Lancaster | Carl Zappfe | Story of Fracture |

## Milwaukee Takes Look At Castings of Future

Reported by William H. Myers
*Metallurgical Dept., Macwhyte Co.*

The technical speaker for the November meeting of the Milwaukee Chapter was Richard Herold, manager of foundry products department, Chemical Division, the Borden Co. He spoke on "Castings of the Future".

Mr. Herold explained that shell molds are produced by applying a dry blend of silica sand and thermosetting resin to a very accurately produced, heated metal pattern or pattern plate and curing the shell at temperatures up to 1000° F. The curing process is accomplished in a matter of seconds, seldom taking more than ½ min.

Shell molding, a relatively new process, is a tool about which little is known, and much research, experiment and development work remains to be done. It is not offered as a panacea for all casting troubles but does offer a degree of accuracy of 0.0002 to 0.0003 in. per in. of castings. The speaker showed samples of extremely accurate and smoothly finished precision castings of nonmachinable alloys, ferrous and nonferrous castings, which had been produced by shell molding.

Mr. Herold stated that shell molding has proven suitable for every type of metal, including stainless steels, and only in low-carbon steels has difficulty been experienced. Gating technique in shell molding is different and requires individual study and solution.

The heat present in pouring tends to break down shell molds and in some cases requires the mold to be reinforced with shot or other supporting material during actual pouring.

Citing the fields which shell molding is currently serving, Mr. Herold listed automotive, aviation, farm implement, plumbing, hydraulic, railroad, marine and electrical castings. He emphasized the fact that the greatest investment has been made by the automotive industry, which has already constructed new plants and developed its own machines to adapt the process to its uses.

# Chicago Reminisces With Billy Williams

*William H. Eisenman, National Secretary A. S. M., and William (Billy) Williams, a Founder Member of the Society, Are Shown at the November Meeting of the Chicago Chapter Which Was National Officers Night*

Reported by Braly S. Myers
*Manufacturing Research*
*International Harvester Co.*

National Officers' Night which was held by the Chicago Chapter in November, honored a founder member of the Society, Billy Williams, National President R. L. Wilson, and National Secretary, W. H. Eisenman. Talk about the early history of the organization was the main topic of conversation among the old-timers present at the meeting, who reminisced about their early experiences with the Society.

W. H. Eisenman brought the members up-to-date on the American Society for Metals, restating its aims, objectives, accomplishments, and services to industry and technical men. Ralph Wilson presented a talk on "Present Trends in High-Temperature Steels".

William (Billy) Williams, 87 years young, was one of the important contributors of authentic facts concerning the early days of steel treaters. He reminisced about the hardships and struggles that the Society went through for survival. He was a member of the American Steel Treaters Society in Chicago and helped lay the groundwork for its amalgamation with the Steel Treating Research Society of Detroit to form the American Society for Steel Treating in 1920, now the American Society for Metals. In this work he was associated with Arthur Henry and Ted Barker, founder members, both now deceased.

Billy told about the starting of the first National Convention. Arthur Henry said that we were going to have a metals show. Ted Barker said, "Call the wagon because Art has gone coo-coo". Nevertheless, a short time later, Henry, Barker and Williams went over to the old Chicago Amphitheater, where the present one now stands. The management wanted $8000 rent. Henry said "I didn't know there was that much money in the world". They then went over to the Armory and were able to make arrangements for the first show to be held there.

Billy Williams, in spite of his age, is still active in the sales department of the Metal Lubricants Co., and calls on customers daily.

## Canadians Hear About Slag-Metal Reactions

Reported by J. McNichol
*Algoma Steel Corp.*

Ralph Farley, director of process development at Republic Steel Corp. in Chicago, was guest speaker at the Northern Ontario Chapter in November. Mr. Farley's talk "Slag-Metal Reactions", proved especially interesting to many members associated with work in the blast furnaces and openhearth of Algoma Steel Corp., Ltd.

Chemical reactions, Mr. Farley said, may be controlled in the manner and degree we wish, if we control the conditions under which they take place. All chemical systems must obey two fundamental laws of nature, the law of conservation of matter or energy (there can be no creation or destruction of matter or energy) and energy seeks its own level. The applications of these laws in steelmaking determines what chemical reactions cannot take place.

Basing his talk on openhearth chemical reactions, Mr. Farley said that the electric furnace is the best production-scale method for studying the reactions which take place under certain specified operating conditions. The main chemical reaction in an openhearth furnace is the production of carbon monoxide from carbon and oxygen. The control of this reaction is important since it is concerned with production and quality in steelmaking. The carbon monoxide is mainly formed in bubbles at the bottom of the openhearth bath. High solubility of the bath for the gas resists this bubble formation causing a slowing down in the formation of a heat of steel.

Mr. Farley also discussed the reactions of sulphur and phosphorus in steel. Sulphur must be eliminated from the bath to the slag in order to produce the required steel physical properties such as surface quality, ductility, and cleanliness. Phosphorus is oxidized out of the metal bath into the slag and is held there mainly by basicity and oxidizing power. The rates of these reactions are affected by temperature. The reactions are reversible; the phosphorus equilibrium depends upon temperature as well as basicity and oxidizing power, the sulphur equilibrium usually upon basicity alone. Reversion to the metal results when the effective conditions change in a manner to exceed the equilibrium distribution between slag and metal.

## Joint Meeting of Technical Societies Held in Columbus

The Columbus Chapter joined the Columbus Technical Council in a joint meeting of all technical societies in the area in November.

The technical session covered "Corrosion Problems", an illustrated discussion by Frank L. LaQue, in charge, corrosion engineering section, International Nickel Co., Development and Research Division. His talk included a report on recent developments in corrosion prevention.

### New Company Formed

Rolled Alloys, Inc., heat and corrosion resistant specialists, formerly the Rolled Products Division of the Michigan Steel Casting Co., is now an independent company handling rolled mill forms of chromium-nickel alloys. This company has been formed to continue the development of wrought heat resisting alloys and to expand the facilities to serve this market throughout the United States. All personnel formerly connected with the Rolled Products Division are now with Rolled Alloys, Inc. Paul Goetcheus is president of the company, with offices in Detroit.

## Gives Talk on Metallographic Techniques

*J. R. Vilella (Center) Presented a Discussion on "Metallographic Techniques" at the December Meeting of the Lehigh Valley Chapter. With Mr. Vilella are W. N. Rice (left), chapter chairman, and H. F. Paulus*

Reported by D. A. Lamb
*Ingersoll-Rand Co.*

J. R. Vilella, metallurgist at U. S. Steel Corp.'s Research Laboratory, gave a talk on "Metallographic Techniques" before the members and student guests at the December meeting of the Lehigh Valley Chapter.

Mr. Vilella stressed the need for meticulous polishing. The metallographic specimen, like any other sample, must be truly representative of the parent metal, both as to chemical composition and physical condition, to be of any value.

The speaker next considered the proper selection of an etchant. The etching reagents most frequently used to disclose the structure of steel are an alcoholic solution of nitric or picric acid, commonly referred to as nital and picral, respectively. According to Mr. Vilella, the best general purpose etchant is a 4% picral solution.

Mr. Vilella continued by discussing photomicrography and its many ramifications, and used numerous slides to illustrate good and bad techniques in polishing, etching and photographing.

## Cincinnati Hears Cohen Discuss Heat Treatment of Steel

Reported by James Terry
*Latrobe Steel Co.*

The Cincinnati Chapter heard a lecture on the "Heat Treatment of Steel" by Morris Cohen of Massachusetts Institute of Technology, at the November meeting.

Dr. Cohen opened his lecture by stating that he would talk on the technical aspects of heat treatment, and reviewed the iron-carbon diagram as a prelude to a detailed discussion of the mechanics of the hardening of steel. He called attention to three fundamental factors which apply to the hardening of a steel, whether carbon or alloy. These are: Hardening depends on the formation of a martensitic structure; hardenability depends on the ability to avoid pearlite or bainite during heat treatment; and hardness depends on the carbon content of the martensite developed during heat treatment.

Dr. Cohen pointed out that plastic strain in hardened steels, even in the tempered condition, will transform retained austenite to untempered martensite which, in turn, causes brittleness. This suggests the advisability of retempering hardened steel which may be subjected to surface or internal plastic strain after hardening.

Another interesting point made by the speaker was the fact that prolonged tempering of high speed steel beyond 2½ hr. does not toughen all the martensite because a substantial part of it forms from the retained austenite on cooling from the tempering treatment. However, double tempering will alleviate this situation because the second heating tempers the martensite produced during cooling from the first heating.

Dr. Cohen's talk included discussion of internal stresses formed in quenching, the mechanism of tempering and an explanation of the "blue brittle range" in tempering. He further noted that hot quenching high speed steel will result in a structure containing excessive retained austenite, thus causing a weak tool even after the standard tempering operation. He stated that this weakness may be overcome by triple tempering.

## Opens New Laboratory

A new laboratory providing complete facilities for testing and developing materials, equipment and processes for customers has been opened at the F. J. Stokes Machine Co., Philadelphia. The new facilities occupy about 2800 sq. ft. of floor space and represent an investment of more than $150,000.

A representative selection of Stokes extrusion, molding, preforming and compacting presses used in the plastics, ceramics and powder metallurgy industries has been installed. Many new dies and accessories, improved methods, and experimental powdered metal mixtures and plastics compounds will undergo trial runs in this section of the laboratory.

The new laboratory's work is carried on by Earl W. Flosdorf, Stokes' director of research and development, and his assistants, Joseph F. Piotrowski and William H. Hamilton.

## Wilson Is Guest of Mahoning Valley

*Ralph L. Wilson, A. S. M. President, Was the Guest of the Mahoning Valley Chapter at the December Meeting, Which Was National Officers Night. Shown with Mr. Wilson (center) are K. L. Fetters, Youngstown Sheet and Tube Co., technical chairman, and Robert Hill, Sharon Steel Co. An innovation at this meeting was a display by the Youngstown Public Library of recent metallurgical books and periodicals available at the library*

# Explains Brittle Failure of Weldments

Reported by R. C. Pocock
*Chief Engineer*
*Bendix Products Div.*

A joint session of A.S.M. and American Welding Society members met at the University of Notre Dame in December to hear William S. Pellini, head of foundry and welding research at the Naval Research Laboratory, Washington, D. C., present a talk on the "Factors Which Determine the Brittle Failure of Weldments".

Mr. Pellini's talk was based primarily on his experience at the Naval Laboratory where he has investigated the basic causes for the failure of large weldments, such as the all-welded ships developed during the war. As in all new developments, unexpected troubles arose, and cracks of a magnitude not encountered before were reported. In extreme cases, ships suddenly cracked in two. He brought out the fact that these failures could not be ascribed entirely to high stresses or unusual storm conditions, inasmuch as some failures also occurred while the ships were at dock.

Their investigation, which was reported in an article in the *Welding Journal* in December 1952, showed that the common structural steels available to shipbuilders go through a notch ductility transition—a steel which has satisfactory notch ductility at normal "warm" temperatures (above 70° F.) will develop high notch sensitivity and become extremely brittle at "cold" temperatures (20 to 60° F.).

Tests on various steels showed that when the "Charpy V" energy at a particular temperature dropped below 10 ft-lb., the material was susceptible to the initiation of brittle fracture under elastic loading if a sharp flaw was present. Arc strikes were especially guilty of this triggering action due to the associated sharp, crack-like flaws.

The method of testing was rather startling to those accustomed to the more prosaic testing methods. It consisted of setting off an explosive charge in air above the surface of the piece (14 x 14 in. plate) which was placed over a die, resulting in the development of a small bulge-like depression. Crack starting was accomplished by the use of a brittle weld bead. In effect the brittle weld developed a cleavage crack which then caused the plate to be loaded in the presence of a flaw of extreme sharpness. The resultant cracking or refusal to crack indicated the characteristics of the material at the temperature. Tests of ship steels indicated that the transition from ductile (no cracking) to brittle performance occurred at the same temperature range as experienced in the ship failures (60 to 70° F.).

Mr. Pellini showed that by a proper choice of materials these failures could be avoided. It is not the presence of the weld that causes failures, but the notch sensitivity of the material being welded. The big problem is how to develop facilities in the steel mill which will turn out these special-property steels on a high tonnage production basis.

## Speaker Explains Problems Faced by Watch Industry

Reported by David Ballard
***Metallurgist***
***National Bureau of Standards***

Harry L. Hovis, chief chemist, Hamilton Watch Co., presented an informal lecture and technicolor movie on "Metallurgy in the Watch Industry" at the November meeting of the Washington Chapter.

The speaker stressed the strict control over machining tolerance and heat treatments required on the 110 to 120 different parts in each watch. Because of the limited volume and high precision standards required, the watch industry has developed its own complete production and processing facilities for special alloys. Wrist watches require as many as 16 different alloys which are combined into a precision timepiece working at the rate of 432,000 ticks per day at an accuracy of ±1 sec. per 24 hr. For example, a 10-lb. ingot is processed down to 3½ lb. and 250,000 hairsprings emerge as the final product.

Mr. Hovis also stressed materials control, plating, cleaning and other data relative to the metallurgical phases of watch manufacturing.

## New Names Added to Quarter-Century Club

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the Society:

**Milwaukee Chapter**—N. E. Nelson, Leland E. Grant, L. J. Larson. Chain Belt Co.—sustaining member.

## *New Jersey Completes Lecture Series*

*Members and Guests of the New Jersey Chapter Are Shown at the Sixth Lecture in the 1952-53 Educational Course Presented by the Chapter. R. E. Liebendorfer, Wright Aeronautical Corp., presented the six lectures on "Making, Shaping and Treating Metals". (Reported by Raymond A. Grange, U. S. Steel Research Laboratories)*

# *Junior Members'*

# PLACEMENT SERVICE

**Listed on the following pages are the qualifications of junior members of the American Society for Metals who are graduating (or who are candidates for advanced degrees) in the field of metallurgy. Most of these men will be available between now and next summer. They are grouped according to the school attended, on the pages indicated by the table of contents below. The name of the head of the department of metallurgy at the school, and in most instances, the name of the faculty member in charge of student placement, is indicated. Further information about any of these graduates may be secured from the head of the department or by writing to the student direct.**

## University of Alabama

### Eugene E. Langner, Jr.

***Degree Expected*: M. S. in Met. Eng.**

School Address: General Delivery, University, Ala.
Home Address: 1727—31st Ave. No., Birmingham 4, Ala.

Age 22, single; draft status 2S. Has 42 semester hours in ferrous and nonferrous metallurgy. B. S. in metallurgical engineering. Thesis: "The Effect of Carbon Equivalent on Machinability and Microstructure of Cast Iron". Three summers training in foundry industry under F.E.F. plan. Prefers research, development or production in ferrous metals. Available February.

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## Carnegie Institute of Technology

### John A. Alexander

***Degree Expected*: B. S. in Met. Eng.**

School Address: 2302 Manor Ave., Pittsburgh 18, Pa.
Home Address: Same

Age 21, single; to receive R.O.T.C. commission in Ordnance Corps. Senior thesis: "The Kinetics of the Mn Reaction Under Basic Openhearth Conditions." Worked two summers as metallurgical observer at U. S. Steel Co.'s Homestead Works, and as laboratory assistant at school. Band, tennis, officer in social organization. Prefers process metallurgical work in Pittsburgh area. Available June 8.

### Michael R. Bailleul

***Degree Expected*: M.S. in Met.**

School Address: 5634 Northumberland St., Pittsburgh 17, Pa.
Home Address: Same

Age 27, married, French. Holds Diploma Ing. from Ecole Centrale, Paris. Studies included four years theoretical studies, advanced mathematics, physics, chemistry, two years general engineering and one year specialization in metallurgy. Now studying metallurgy and statistical quality control. Summer employment record. Employed three months in Citroen Cars Co., Paris. Prefers alloy steel production research or engineering sales. Available July.

### George J. Barth

***Degree Expected*: B. S. in Met. Eng.**

School Address: 209 Boss Hall, Carnegie Institute of Technology, Pittsburgh, Pa.
Home Address: 2718 Middletown Rd., Pittsburgh 5, Pa.

Age 21, single; draft status 2S. Courses include ferrous and nonferrous production metallurgy, physical chemistry, metallurgical calculations, mechanical metallurgy, and refractories. Desires work in ferrous production metallurgy. Prefers East. Available June.

### Robert F. Byrne

***Degree Expected*: B. S. in Met. Eng.**

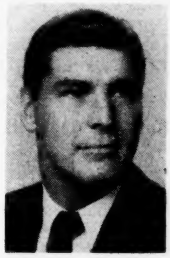
School Address: 5020 Morewood Place, Pittsburgh 13, Pa.
Home Address: 601 Church St., Herminie, Pa.

Age 21, single, draft status 2S. Courses include process and physical metallurgy, ferrous and nonferrous metallography, phase diagrams, mechanical metallurgy, petrography, physical chemistry. Summer experience in ore research laboratory, part-time work in metallography. Fraternity member; junior member A.I.M.E. Prefers production or research. No territorial preference. Available June 15.

### Thomas B. Craig

***Degree Expected*: B. S. in Met. Eng.**

School Address: Box 333, Carnegie Institute of Technology, 202 Schobell Hall, Pittsburgh, Pa.
Home Address: 704 Josephine St., East McKeesport, Pa.



Age 20, single, draft status 2S. Fraternity member, football and basketball teams. Courses include physical metallurgy, ferrous and nonferrous production metallurgy and metallography, refractories, electrical and mechanical minors. Thesis: "Patent Law and the Modification of Aluminum-Silicon Alloys." Practical experience in openhearth department as a slagger. Prefers management or sales in Pittsburgh, but other areas considered. Available June 15.

### George E. Dieter

***Degree Expected*: Ph. D. in Metallurgy**

School Address: 928 St. James St., Pittsburgh 32, Pa.
Home Address: Same

Age 24, married, holds reserve commission in Ordnance Corps. B. S. in Met. Eng. from Drexel Institute of Technology. Graduate subjects include advanced physical and mechanical metallurgy, alloy steels, theory of metals, elasticity, heat flow, phase diagrams. Thesis: "Statistical Nature of Fatigue of Metals." Laboratory experience at Frankford Arsenal, Westinghouse, E. F. Houghton Co. Fraternity member. Desires research or development in mechanical or physical metallurgy. Interested in ordnance development. East preferred. Available June.

### Roger R. Giler

***Degree Expected*: B. S. in Met. Eng.**

School Address: 5677 Beacon St., Pittsburgh 17, Pa.
Home Address: Same

Age 23, single, draft status 2S. Regular curriculum in metallurgical engineering. Member S.A.E. Knowledge of French and German. Laboratory experience. Prefers field engiginering, here or abroad, with home office around Pittsburgh. Available July.

***FOR FURTHER INFORMATION about these graduates***
*Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on pages 25 and 26.*

# Carnegie Tech. (Cont.)

**Richard E. Goss**
*Degree Expected: B. S. in Met. Eng.*

School Address: Box 229, Carnegie Institute of Technology, Pittsburgh, Pa.
Home Address: 103B Harper Dr., Turtle Creek, Pa.

Age 21, single, draft status 1D (R.O.T.C.) Courses include physical chemistry, physical, process, ferrous and nonferrous metallurgy, mechanical metallurgy, seminars, and metallurgical. . engineering. Thesis: "Beneficiation of Iron Ores." Active in extracurricular activities. Worked two summers in steel industry. Desires production or control work. East or Midwest, preferably western Pennsylvania or Ohio. Available June.

**Joseph A. Morgan**
*Degree Expected: B. S. in Met. Eng.*

School Address: 203 Jucunda St., Pittsburgh 10, Pa.
Home Address: Same

Age 21, single, draft status 2S. Courses include physical metallurgy, ferrous and nonferrous metallography, mechanical and process metallurgy. Has worked summers in blast furnace and openhearth departments. Laboratory assistant to graduate students. Desires work in research and development in Pittsburgh area. Available June 14.

**Robert W. Stroble**
*Degree Expected: B. S. in Met. Eng.*

School Address: 332 Newburn Dr., Pittsburgh 16, Pa.
Home Address: Same

Age 22, single, draft status 1A. Courses include standard metallurgical curriculum, ferrous and nonferrous metallurgy and metallography, physical chemistry and metallurgy, process metallurgy, mechanical and electrical engineering, industrial psychology, physics, chemistry, mathematics and statistical quality control. Experienced in mechanical testing division of research and development laboratory (two summers). Desires production or development work in ferrous industry, preferably in Pennsylvania or vicinity. Available July 1.

**Charles R. Wilkins**
*Degree Expected: B. S. in Met. Eng.*

School Address: 1091 Morewood Ave., Pittsburgh 13, Pa.
Home Address: 15211 Braemar Dr., Cleveland 11, Ohio

Age 22, single, draft status 1A. Holds B.A. from Baldwin-Wallace College. Courses include ferrous and nonferrous metallurgy, and ferrous and nonferrous metallography, phyical metallurgy, physical chemistry, engineering metallurgy, and electives in metallurgical calculations and refractories. Two summers in ferrous industry as clerk and observer. Desires industrial or producing industry in ferrous metals. Midwest preferred but not essential. Available June.

# University of Alaska

**Robert D. Lear**
*Degree Expected: B. S. in Met. Eng.*

School Address: Box 123, College, Alaska
Home Address: Same

Age 22. Member of student chapter A. I. M. E. One summer general surveying, part-time work for year for Territorial Department of Mines, Assay Office. Work consisted of fire assaying and wet analysis, mainly for tungsten. Student assistant in metallurgy laboratory. Desires extractive metallurgy of nonferrous metals—lead, zinc, copper or tungsten preferred. Prefers Alaska location. Available May.

# Case Institute of Technology

**Niculae Boboe, Jr.**
*Degree Expected: B. S. in Met. Eng.*

School Address: 2099 Cornell Rd., Cleveland, Ohio
Home Address: 445 Lafayette St., Bridgeport, Conn.

Age 24, single, inactive Naval reserve (served 39 months in U. S. N.) Experienced as aviation metalsmith. Courses include physical metallurgy, ore dressing, production metallurgy, physical chemistry, metal forming, quality control, personnel relations. Prefers production work or sales. Summer experience in ferrous foundry. East desired but not essential. Available June 15.

**Stuart M. Campbell**
*Degree Expected: B. S. in Met.*

School Address: 3376 Silsby Rd., Cleveland, Ohio
Home Address: Same

Age 21, single, draft status 2S. Courses include physical chemistry and metallurgy, forming of metals, electrometallurgy, ferrous and nonferrous production. Experience includes one summer as laboratory assistant doing work on spheroidization of strip steel, and two summers in machine shop. Desires production work in ferrous or nonferrous fabrication. Eastern half of country preferred. Available June 8.

**Roger B. Conant**
*Degree Expected: B. S. in Met. Eng.*

School Address: Case Dormitory Box 204, Case Institute of Technology, Cleveland 6, Ohio
Home Address: 28 Howard St., Arlington 74, Mass.

Age 30, single, veteran, now in inactive Naval air reserve. Courses include ore dressing, production and advanced ferrous metallurgy, metal forming, advanced physical metallurgy, foundry technology, practical metallurgical engineering, quality control, industrial organization and psychology. Two and one half years in machine tool company as demonstrator on sales and service work. One summer in commercial heat treating company. Prefers production or quality control. Northeast preferred. Available June 15.

## Case Tech (Cont.)

### William H. Dahlman

*Degree Expected: B.S. in Met. Eng.*

School Address: 3876 East 140th St., Cleveland 20, Ohio

Home Address: Same

Age 22, draft status 1D (U.S.N.R.). Studies include mechanical properties of metals, ore dressing, physical chemistry, physical metallurgy, ferrous and nonferrous foundry, foundry technology, practical metallurgical engineering. Foundry Educational Foundation Scholarship. Student activities. Worked one summer as foundry maintenance man, one summer in training program of large gray iron foundry. Prefers production or sales in foundry, Midwest. Available June 15.

### Ronald V. Dubbins

*Degree Expected: B.S. in Met. Eng.*

School Address: 1347 Westlake Ave., Lakewood 7, Ohio

Home Address: Same

Age 21, single, draft status 2S. Majoring in foundry. Foundry Educational Foundation Scholarship. Electives include business law, personnel administration, psychology, welding, advanced physical metallurgy, and ferrous and nonferrous foundry. School activities. Worked in gray iron and steel foundry as metallurgical laboratory technician at tank plant. Desires work in ferrous foundry. No territorial preference. Available June.

### Robert J. Gridley

*Degree Expected: B.S. in Met.*

School Address: 11318 Bellflower Rd., Cleveland 6, Ohio

Home Address: 2593 Dysart Rd., University Heights 18, O.

Age 21, single, draft status 2S. Courses include production metallurgy, physical and advanced ferrous metallurgy, practice of metallurgical engineering, industrial organization, psychology, personnel administration. Summer work as annealing furnace helper in steel plant and drawing production charts and graphs in foundry. Desires producing industry, industrial plant or sales with steel, malleable, or gray iron. Available June 20.

### Bruce W. McLeod

*Degree Expected: B.S. in Met.*

School Address: 11240 Bellflower Dr., Cleveland 6, Ohio

Home Address: 10717 Park Heights Ave., Garfield Heights 25, Ohio

Age 21, single, draft status 2AS. Courses include ore dressing, strength of materials, ferrous and nonferrous production metallurgy, physical metallurgy, applied electricity, psychology, welding, metal forming, advanced ferrous metallurgy, business law, nonferrous foundry metallurgy, electrometallurgy, economic geology. Summer experience in malleable iron foundry and heat treating plant. Prefers work in production or sales (Al, Co, or Fe). No location preference. Available June 15.

### A. Donald Mead

*Degree Expected: B.S. in Met. Eng.*

School Address: 2540 Loop Dr., Apt. 237, Cleveland 13, O.

Home Address: Box 55, Zoar, Ohio

Age 27, married, one child, inactive Naval reserve. Major studies in foundry. Honor and social fraternities. Has worked as chemist, melt stocker in engineering and foundry company, shipping, receiving and foundry clerk, heat treating department, and maintenance work. Prefers iron or steel foundry. No location preference. Available July 15.

### Robert C. Mikol

*Degree Expected: B.S. in Met. Eng.*

School Address: 8513 Madison Ave., Cleveland 2, Ohio

Home Address: Same

Age 31, married, one child, veteran. Studies include physical chemistry and metallurgy, foundry technology and metallurgy, humanities, psychology, production management, business and professional speaking, accounting. Foundry Educational Foundation Scholarship. Fratority member. Six years foundry experience, both administrative and technical, aluminum, magnesium and malleable iron. Prefers sand-cast metal industry. Will relocate. Available June 8.

### Jacob P. Schmidt

*Degree Expected: B.S. in Met. Eng.*

School Address: 7646 New York Ave., Cleveland 5, Ohio

Home Address: Same

Age 31, married, one child, veteran, inactive Air Force Reserve. Courses include physical and production metallurgy, ferrous and nonferrous, advanced ferrous metallurgy and physical metallurgy, extractive metallurgy. Various courses in business and humanities. Fraternity member. Three years in steel processing and rolling, stainless and carbon strip. Summer and part-time work in metallurgical department at school. One summer in physical testing laboratory. Desires work in ferrous production or connected work. No location preference. Available June 1953.

### Lawrence W. Thomas

*Degree Expected: B.S. in Met. Eng.*

School Address: 3140 Washington Blvd., Cleveland Heights 18, Ohio

Home Address: 535 Pelham Rd., New Rochelle, N. Y.

Age 21, single, draft status 2S. Studies include physical chemistry and metallurgy, ferrous and nonferrous production metallurgy, metal forming, welding processes, personnel administration. Fraternity, social activities. Summer work in research laboratories. Desires production and development work. Any location. Available June 15.

## Case Tech (Cont.)

**John D. Wood**
*Degree Expected: B.S. in Met. Eng.*
School Address: Case Dorm Box 213, Cleveland 6, Ohio
Home Address: 722 Mountain Ave., Westfield, N. J.

Age 22, single, draft status 1D (A.F.R.O.T.C.). Courses include physical chemistry and metallurgy, advanced ferrous metallurgy, advanced physical metallurgy, metal forming and mineralogy. Worked one summer as laboratory technician in nonferrous industry. Attended Ohio Wesleyan University for three years. Prefers production industry, either ferrous or nonferrous. No location preference. Available June.

## University of Cincinnati

**Carl J. Altstetter**
*Degree Expected: Met. Eng.*
School Address: French Dorm, University of Cincinnati, Cincinnati 21, Ohio
Home Address: 1466 West Market St., Lima, Ohio

Age 22, single, draft status 2AS. Courses include process and physical metallurgy, metallography, foundry technology, corrosion, electrometallurgy, thermodynamics, electrical engineering, physical chemistry. Fraternity and social activities. Three years co-op experience in production and development metallurgical laboratory in stress analysis, fatigue testing, specification writing and metallurgical trouble shooting, including ferrous, nonferrous and nonmetallic materials. Prefers development research or producing, preferably in large city. Available June 8.

**Gerald X. Diamond**
*Degree Expected: Met. Eng.*
School Address: 633 Forest Ave., Cincinnati 29, Ohio
Home Address: Same

Age 22, single, draft status 2S. Courses include mathematics through integral calculus, chemistry, physical chemistry, thermodynamics, extraction metallurgy, electrometallurgy, physical metallurgy, metallography, failure analysis, electrical engineering fundamentals. Work includes chemical analysis, electroplating, metallurgical research. School technical and social activities. Prefers graduate work on teaching or research-assistantship, or privately sponsored space research. No locality preference. Available October 1953.

**Lee John Droege**
*Degree Expected: Met. Eng.*
School Address: French Dorm, University of Cincinnati, Cincinnati 21, Ohio
Home Address: 1404 Old State Rd., Covington, Ky.

Age 24, single, veteran. Eleven months electronics school in Navy. Night courses in German and accounting. Courses include marketing, economics, patent and contract law, corrosion, electrometallurgy, other prescribed metallurgical courses. Fraternity and social activities, sports. Interested in sales and promotion in expanding company. No location preference. Available August.

**Walter E. Herman**
*Degree Expected: Met. Eng.*
School Address: French Dorm, Box 160, University of Cincinnati, Cincinnati 21, Ohio
Home Address: Box 235, Kinsman, Ohio

Age 24, single, veteran. Subjects include economics, marketing, business correspondence, corrosion, electroplating, furnaces and refractories, metallography, cast metals, as well as prescribed metallurgical courses. Professional and social activities. Co-op work in metallurgical department of major steel producer, experienced in most phases of steelmaking and processing. Desires work in producing industry or industrial plant leading to sales or contact work. No location preference. Available July.

**Myles C. Kunkel**
*Degree Expected: Met. Eng.*
School Address: 5510 Rapid Run Rd., Cincinnati, Ohio
Home Address: Same

Age 25, single, draft status 4A. Courses include physical and extraction metallurgy, electrometallurgy, corrosion, process engineering, specifications, heat treatment, heat transfer, strength of materials and metal failures analysis. Co-op work in Bonderite control, cast iron foundry, physical and chemical testing. Desires work in plant or producing industry. Cincinnati location preferred. Available June 15.

**Neil M. Lottridge**
*Degree Expected: Met. Eng.*
School Address: French Dorm, University of Cincinnati, Cincinnati 21, Ohio
Home Address: 4299 Cumberland, Berkeley, Mich.

Age 22, single, R.O.T.C. Courses include thermodynamics, heat transfer, fluid flow, physical chemistry and metallurgy, metallography, heat treating, electrometallurgy, corrosion, cast metals, foundry technology, and economics. Foundry Educational Foundation Scholarship. Fraternity member. Co-op experience in gray iron foundry and large research foundry. Production or research foundry work preferred but not essential. No location preference. Available August.

**Fred J. Reinker**
*Degree Expected: Met. Eng.*
School Address: French Dorm, University of Cincinnati, Cincinnati 21, Ohio
Home Address: 3219 West 88th St., Cleveland 2, Ohio

Age 23, single, draft status 2S. Courses include physical chemistry and metallurgy, thermodynamics, corrosion, metallography of cast metals, metallurgical specifications, principles of electroplating, foundry technology. Foundry Educational Foundation Scholarship. Co-op work in foundry includes experience in sand testing, laboratory work, melting, pouring, quality control, standards and maintenance. Prefers production in gray cast iron; metallic research secondary. Midwest preferred but not essential. Available June 15.

# Cincinnati (Cont.)

**Charles E. Scott**
*Degree Expected: Met. Eng.*

School Address: 8344 Curzon Ave., Cincinnati 16, Ohio
Home Address: Same

Age 23, single, draft status 2S. Courses include physical metallurgy, electrometallurgy, heat treating, thermodynamics, surface reactions, steel selection, hardenability. Co-op work includes general analytical and quality control work in electroplating plant and nonferrous foundry. Work included X-ray and mass spectrograph testing, general control work. Prefers sales or production work. No regional preference. Available June.

**Harry W. Young**
*Degree Expected: Met. Eng.*

School Address: 2046 Weyer Ave., Norwood 12, Ohio
Home Address: Same

Age 35, married, one child, veteran. Courses include physical chemistry, surface reactions, extraction, physical metallurgy, heat treatment and material specifications. Co-op work at large machine tool company, including operating and assembly of machine tools, metallurgical laboratory, foundry and research. Prefers research or industrial work with ferrous or nonferrous metals. Midwest preferred. Available June.

# Colorado School of Mines

**Om Prakash Arora**
*Degree Expected: M.S. in Met. Eng.*

School Address: P.O. Box 392, Golden, Colo.
Home Address: Shri Ram Arora, Atrauli (Aligarh), India

Age 27, single. B.S. in Met., Hindu University M.S. work includes X-ray diffraction, spectrography, production of iron and steel. Thesis: "Study of Monazite Sands by Spectrographic Methods; Phase Equilibrium". Has worked in automotive works in India, dealing with carburizing, cyaniding of automobile parts and pistons plus control laboratory and mechanical testing. Research laboratory or heat treatment shops, anywhere in U. S. Available September.

**Dunston F. Boyd**
*Degree Expected: Met. Eng.*

School Address: 412-22nd St., Golden, Colo.
Home Address: Box 957, Grand Junction, Colo.

Age 22, married, Army Reserve Corps. Courses include advanced quantitative analysis and mineral dressing, physical metallurgy, practical spectrography, hydrometallurgy, physical chemistry, and other required courses. Experienced in laboratory analysis, sample preparation, precipitation, research work in ore dressing. Prefers chemical or ore dressing plant operation. West or South America. Available June 1.

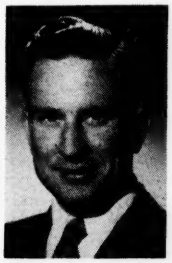
**William H. Cooke**
*Degree Expected: Met. Eng.*

School Address: 36 Prospector Park, Golden, Colo.
Home Address: 4457 Quitman St., Denver 12, Colo.

Age 24, married, one child, veteran, draft status 4A. Courses include assaying, nonferrous production, mineral dressing, metallurgy of iron and steel, hydrometallurgy, physical metallurgy, and spectrography. Desires ferrous or nonferrous producing industry. West preferred. Available June 1.

**Francis E. Gibson**
*Degree Expected: Met. Eng.*

School Address: 13 Prospector Park, Golden, Colo.
Home Address: 6412 Repton St., Los Angeles 42, Calif.



Age 26, married, veteran, draft status 4A. Courses include metallography, spectrography, powder metallurgy, industrial relations, design, mineral processing, physical metallurgy, business law. Social and honorary fraternities and clubs. ARASCO scholarship. Welding and photography experience. Desires sales engineering or production. West preferred but not essential. Available June 1.

**Harold T. Hoak**
*Degree Expected: Met. Eng.*

School Address: Sigma Phi Epsilon House, Golden, Colo.
Home Address: 1529 Pierce Ave., Niagara Falls, N. Y.

Age 28, married, draft status 5A. Courses include physical chemistry, general and physical metallurgy, mineral dressing hydrometallurgy, electrometallurgy, metallography, spectrography, thermodynamics, designs, ferrous metallurgy, X-ray diffraction, electrical engineering, economics. Three years experience in control analysis, one year as furnace and utility man in ferro-alloy furnace room, two years as chemical operator, one summer metal packer and sampler. Desires development or production, physical metallurgy, electric-furnace, steel or foundry. No location preference. Available June 15.

**Robert L. Kerwin**
*Degree Expected: Met. Eng.*

School Address: SAE House, Golden, Colo.
Home Address: 1233 South Emerson, Denver, Colo.

Age 21, single, draft status ID (R.O.T.C.) Courses include hydrometallurgy, ore dressing, mining, mill design, machine design. Summer experience as sales trainee for equipment company. Social and professional activities. Desires work in extractive metallurgy. No location preference. Available June 1.

***FOR FURTHER INFORMATION** about these graduates*
*Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on pages 25 and 26.*

# Colorado (Cont.)

### Francis O. Mueller
*Degree Expected: Met. Eng.*

School Address: 818 14th St., Golden, Colo.
Home Address: Rt. 1, Box 96, Ellsworth, Kan.

Age 21, single, draft status 2S. Courses include machine shop, blueprint reading, fundamentals of electronics, power distribution, spectroscopy, physical metallurgy, and prescribed courses. Prefers production or research in nonferrous industry. Location immaterial. Available June.

### Stanley Y. Ogawa
*Degree Expected: Met. Eng.*

School Address: 1520 Maple St., Golden, Colo.
Home Address: 196 Walker Ave., Wahiawa, Oahu, T.H.

Age 21, single, draft status 1D. Courses include metallography, ferrous and nonferrous metallurgy, fuels, spectrography, assaying, hydrometallurgy, mineral dressing, physical chemistry, thermodynamics, electrical engineering. Part-time work as student help in physics department. Summer work in sheet metal. Desires production or fabrication. Anywhere in the United States. Available July 1.

### Raymond F. Peluso
*Degree Expected: Met. Eng.*

School Address: 4343 Quivas St., Denver 11, Colo.
Home Address: Same

Age 22, single, draft status 2S. Courses include physical metallurgy, metallography, phase equilibria, industrial relations. Professional fraternity. Worked two summers on engineering staff of construction company and part-time as welder. Prefers research or development in industrial plant. No location preference. Available June 1.

### Theodore W. Rebeck
*Degree Expected: Met. Eng.*

School Address: 37 Prospector Park, Golden, Colo.
Home Address: 2535 Grand Ave., Huntington Park, Calif.

Age 25, married, veteran, draft status 4A. Los Angeles City College for two years. Courses include physical metallurgy, metallography, spectroscopy, metallurgy of iron and steel, corrosion, ore dressing, nonferrous production metallurgy, hydrometallurgy, physical chemistry, industrial electronics. Desires work in physical metallurgy. Prefers West, especially California. Available June.

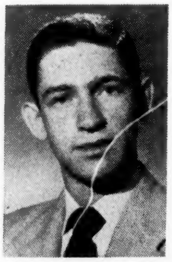
### Thomas J. Ryan
*Degree Expected: Met. Eng.*

School Address: SPE House, Golden, Colo.
Home Address: 15 Wyman St., Worcester 3, Mass.

Age 21, single, draft status 2S. Courses include general metallurgy, patents, nonferrous production, fuels, metallurgy of iron and steel, assaying, mineral dressing, hydrometallurgy, electrometallurgy, metallography, spectrography, industrial relations, design, thermodynamics, minerals, physical metallurgy, X-ray diffraction, phase rule, electrical engineering. Social and technical activities. Summer work in nonferrous forgings. Prefers industrial plant or producing industry. East or Midwest preferred. Available June 15.

### Fred R. Schwartzberg
*Degree Expected: Met. Eng.*

School Address: P.O. Box 455, Golden, Colo.
Home Address: 3591 Bainbridge, New York 67, N. Y.



Age 22, single, draft status 2S. Studies include physical metallurgy, metallography, spectroscopy, electronics, ferrous and nonferrous production, ore dressing, industrial instrumentation. Two years experience as electrical engineering department laboratory assistant. Social, technical and sport activities. Desires instrumentation and control work as applied to metallurgy, or high-temperature development. No location preference. Available June 29.

### George D. Wilkinson
*Degree Expected: Met. Eng.*

School Address: 822 13th St., Golden, Colo.
Home Address: 600 Beacon St., Colorado Springs, Colo.

Age 23, single, draft status 4A (not a member of a reserve organization). Courses include physical and powder metallurgy, spectroscopy, plant design, metallography, thermodynamics, hydrometallurgy, electrometallurgy. One summer of work in coal mine shop. One summer and part-time work with civil engineer in field work. Any location. Available June 1.

### John R. Witt
*Degree Expected: B.S. in Met. Eng.*

School Address: SAE House, Golden, Colo.
Home Address: 213 South Ammons St., Lakewood, Colo.

Age 22, single, draft status 1D (R.O.T.C.). Studies include nonferrous production metallurgy, hydrometallurgy, mineral dressing. Best qualified in hydrometallurgy and flotation principles and practices. Social fraternity. Colorado State Scholarship. Member several technical societies. Summer experience in lead-zinc mining and milling. Prefers hydrometallurgy or mineral dressing, or sales of equipment used in these industries. Any location. Available June 1.

***FOR FURTHER INFORMATION** about these graduates Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on page 25 and 26.*

# Colorado (Cont.)

**Frank T. Wyman**
*Degree Expected: Met. Eng.*

School Address: 822 12th St., Golden, Colo.
Home Address: 635 Eudora St., Denver, Colo.

Age 22, married, draft status 2S. Courses include required chemistry and metallurgy studies, physics, mechanics, strength of materials, thermodynamics, fluids, nonferrous productive metallurgy, assaying, mineral dressing, metallurgy of iron and steel, hydrometallurgy, design, industrial minerals, geology courses. Social and honorary fraternities. Desires nonferrous producing industry. West Coast preferred, but not essential. Available June.

**Peter Yurcisin**
*Degree Expected: Met. Eng.*

School Address: SPE House, 917 15th St., Golden, Colo.
Home Address: 126 Fourth Ave., Roebling, N. J.

Age 21, single, draft status 2S. Courses include mineral dressing, nonferrous metallurgy, fuels, iron and steel, assaying and pyrometallurgy, hydrometallurgy and electrometallurgy, metallography, spectrography, thermodynamics, X-ray diffraction and crystal structure, corrosion, phase equilibria. Social fraternity. Desires research or producing industry, ferrous or nonferrous. Any location. Available June 15.

**Harvey F. Hansen, Jr.**
*Degree Expected: M.S. in Met.*

School Address: 1061 Carr St., Lakewood, Colo.
Home Address: Same

Age 22, single, draft status 4F. Met. Eng. degree from Colorado School of Mines. INCO graduate research fellowship. Thesis: "Intergranular Corrosion of Nickel". Courses include metallography, X-ray diffraction, crystal structure, spectrography, production metallurgy of steel, metallurgy of cast iron, thermodynamics, hydrometallurgy, nonferrous metallurgy. Desires research or production work involving physical metallurgy. West preferred but not essential. Available July 1.

# Columbia University

**Jack S. Brett**
*Degree Expected: B.S. in Met. Eng.*

School Address: 244 West 106th St., New York 25, N. Y.
Home Address: Same

Age 22, single, draft status 2S. Standard engineering training in metallurgy. Editor school yearbook, social activities, holder Krumb Scholarship. Summer experience as laboratory technician in organic chemicals, and junior materials engineer. Prefers development work on East Coast. Interested in managerial training. Available June 3.

**FOR FURTHER INFORMATION** ***about these graduates***
*Write direct to student or to head of metallurgy department or placement bureau at the school. See list on pages 25 and 26.*

**Josef Intrater**
*Degree Expected: M.S. in Met. Eng.*

School Address: 605 West 156th St., New York 32, N. Y.
Home Address: Same

Age 28, single, draft status 5A. Graduated from Technische Hochschule, Stuttgart, Germany, 1949. Thesis at Max Planck Institute: "Sintering of Al-Zn-Fe Alloys". Thesis at Columbia: "Intercrystalline Corrosion of Pure Aluminum". Courses include advanced mechanical metallurgy, reactions in solid metals, elastic properties of metals, advanced chemical thermodynamics, mathematical solutions of engineering problems. Two years as research associate at Columbia on AEC and NACA contracts. Knowledge of languages. Interested in development or production. Any location. Available on short notice.

# Cornell University

**Henry Robinson**
*Degree Expected: B. Met. Eng.*

School Address: 103 North Quarry St., Ithaca, N. Y.
Home Address: 2005 Stockbridge Rd., Akron, Ohio

Age 23, married, one child, 2nd Lt., Army Reserve. Completing 5-year metallurgical engineering curriculum. Technical societies. Work experience includes two summers in foundry industry, one summer as metallurgical observer in steel mill, one summer as AFS research investigator on high-temperature properties of foundry sands. Continuing research as fifth year project. Prefers East or Midwest location. Available June 15.

# University of Detroit

**James J. Hentges**
*Degree Expected: B.Ch.E. (with Met. option)*

School Address: 4001 Florence Ave., Detroit, Mich.
Home Address: 2114 Circular Rd., Toledo 14, Ohio

Age 22, single, draft status 2S. Courses include basic metallurgy, ferrous and nonferrous metals technology, physical chemistry, organic chemistry, fuels and technical analysis, accounting, personnel administration, mechanical drawing. Technical societies. One year's experience in acid electric steel foundry. Desires research, administrative work, or sales. Midwest. Available June.

# Drexel Institute of Technology

**Jack N. Marshall**
*Degree Expected: B.S. in Met. Eng.*

School Address: 3000 North Broad St., Philadelphia 32
Home Address: 10 Sterling Ave., Wilkes-Barre, Pa.

Age 22, married, reserve commission. Courses include physical, process and foundry metallurgy, welding, corrosion and heat resistance of alloys, physical chemistry, strength of materials, thermodynamics. Experience includes 18 months as technical assistant in research and testing laboratory, and work as chemical and metallurgical assistant in steel foundry. Desires quality control work, preferably in foundry. No geographic preference. Available August 1.

## *Grove City College*

**Meade R. D'Amore**
*Degree Expected: B.S. in Met.*

School Address: 522 Stewart Ave., Grove City, Pa.

Home Address: Same

Age 23, married, draft status 1A. Courses include general metallurgy, metallurgical calculations, ferrous metallurgy, physical metallurgy, metallography, heat treatment, physical chemistry, statics, thermodynamics, calculus, strength of materials. Worked as timekeeper while attending school. Prefers production work in ferrous metals or aluminum. No location preference. Available June 15.

**Robert A. Geer**
*Degree Expected: B.S. in Met. Eng.*

School Address: 438 East Main St., Grove City, Pa.

Home Address: 2676 Leechburg Rd., New Kensington, Pa.

Age 30, single, veteran. Courses include physical chemistry and metallurgy, ferrous metallurgy, metallography, heat treatment, strength of materials, salesmanship, nuclear physics. Experienced in openhearth and electric furnace department, two years as heat treater, some experience in direct selling. Prefers production or sales. Any location. Available June 15.

**James B. Hill**
**Degree Expected: B.S. in Met. Eng.**

School Address: 330 Normal Ave., Slippery Rock, Pa.

Home Address: Same

Age 24, single, veteran. Courses include all prerequisite studies for major in metallurgical engineering degree. Past two summers were spent in self-employment. Interested in production or technical sales work. No territorial preference. Available Sept. 1.

**Thomas A. McNary**
*Degree Expected: B.S. in Met. Eng.*

School Address: Box 167, Grove City College, Grove City, Pa.

Home Address: 311 East Lincoln Way, Minerva, Ohio

Age 21, single, draft status 4F. Courses include metallography, heat treatment, ferrous and physical metallurgy, physical chemistry, industrial management. Professional, social organizations. Summer work as general laborer. Desires research or industrial work in Midwest. Available June 15.

**Eugene C. Sundberg**
*Degree Expected: B.S. in Met. Eng.*

School Address: Ketler Dormitory 61, Grove City, Pa.

Home Address: 3213 Washington Ave., Erie, Pa.

Age 23, single, draft status 2S. Courses include general and ferrous, physical metallurgy, metallography, heat treatment, metallography of iron and steel, physical chemistry, strength of materials, industrial management. Technical clubs. Summer work includes foundry and industrial drafting. Foundry field desired, preferably in Northeast location. Available June 8.

## *University of Illinois*

**William B. Bond**
*Degree Expected: B.S. in Met. Eng.*

School Address: 704½ Cottage Grove, Urbana, Ill.

Home Address: Same

Age 24, married, two children, draft status 3A. Worked in metallurgical control laboratory doing chemical analysis, physical testing, photomicrographs and foundry sand testing. Worked as laboratory helper at school as metallographer. Worked in foundry producing heat and corrosion resistant castings in melting department. General metallurgical subjects taken. Prefers foundry control work or metallurgical control in any type metal fabricating industry; particularly interested in foundry control. No location preference. Available June 25.

**James B. Hatch**
*Degree Expected: B.S. in Met. Eng.*

School Address: I-29-B Stadium Terrace, Champaign, Ill.

Home Address: Same

Age 29, married, two children, veteran (parachute demolition). No reserve committments. Courses include ferrous and nonferrous production heat treat, electrometallurgy, foundry, mechanics, pyrometry, physical chemistry, electrical engineering, economics, marketing, law. Machine shop, drafting and selling experience. Journeyman graduate of 4-year industrial drafting and design apprenticeship. Prefer sales or industrial engineering work. Industrial East preferred, but not essential. Available March.

**Edward Kazuk**
*Degree Expected: B.S. in Met. Eng.*

School Address: 1103 West Illinois St., Urbana, Ill.

Home Address: 4755 South Keduale Ave., Chicago 32, Ill.

Age 21, single, draft status 2S. Subjects include physical metallurgy, metallography, production metallurgy, electrometallurgy, powder metallurgy, foundry (ferrous), alloy steels, pyrometry, and deep drawing and pressing. Prefers work in fabrication of metals or foundry research. Experience in foundry research. No location preference. Available June.

***FOR FURTHER INFORMATION about these graduates** Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on page 25 and 26.*

# Illinois (Cont.)

**John R. Lulay, Jr.**
*Degree Expected: B.S. in Met. Eng.*
School Address: 1005 West Oregon St., Urbana, Ill.
Home Address: 3718 North Monticello Ave., Chicago 18, Ill.

Age 22, single, draft status 1A. Courses include ferrous and nonferrous metallography, alloy steels, physics of metals, electrometallurgy, materials testing, pyrometry, foundry and pattern, deep drawing and pressing, geology. Technical activities. Two summers in installing, maintaining telegraphic equipment. Prefers work in physical metallurgy. Chicago or Midwest desired. Available June.

# Illinois Institute of Technology

**Harry F. Boekeloo**
*Degree Expected: B.S. in Met. Eng.*
School Address: 10112 Perry Ave., Chicago 28, Ill.
Home Address: Same

Age 21, single, draft status 2S. Courses include general metallurgical engineering subjects, physical chemistry and management electives. Social fraternity. Summer work in steel mill. Desires sales or production work, ferrous or nonferrous. Chicago area preferred. Available July 1.

**Walter J. Hawkins**
*Degree Expected: B.S. in Met. Eng.*
School Address: 9524 Calumet Ave., Chicago 28, Ill.
Home Address: Same

Age 23, single, draft status 2S. Courses include general metallurgical engineering subjects with chemistry electives. Technical societies. Part-time work as sales clerk. Desires production or development work. No location preference. Available February.

**Norbert R. Kurtz**
*Degree Expected: B.S. in Met. Eng.*
School Address: 618 South Spaulding Ave., Chicago 24, Ill.
Home Address: Same

Age 25, married, draft status 3A. Studies include physical chemistry and metallurgy, structure of metals, liberal studies. Social activities and sports. Experienced in teaching, machine shop, foundry and heat treating. Prefers research and development work. Chicago area desired. Available August.

# University of Kentucky

**Dale T. Williams**
*Degree Expected: B.S. in Met. Eng.*
School Address: P.O. Box 4089, University of Kentucky, Lexington, Ky.
Home Address: 2613 Hale Ave., Louisville, Ky.

Age 21, married, reserve commission in June. Studied physical metallurgy, metallurgical calculations, industrial radiography, ferrous and nonferrous metallography. Technical societies. No experience. Prefers physical metallurgical work, production and application. East preferred. Available June 10.

# Lafayette College

**Jay E. Barrett**
*Degree Expected: B.S. in Met. Eng.*
School Address: 81 Newkirk, Lafayette College, Easton, Pa.
Home Address: 25 Bonnell St., Flemington, N. J.

Age 26, single, Lt. (jg) Naval Reserve. Courses include principles of mining, shop processes, foundry, physical chemistry and metallurgy, metallurgical engineering, nonferrous metallurgy, thermodynamics, mineral dressing, advanced physical metallurgy, advanced foundry, powder metallurgy, light metals. Fraternity. Prefers nonferrous industry, especially aircraft and related alloys, production or development. East desired. Available June 30.

**Charles A. Cincilla**
*Degree Expected: B.S. in Met. Eng.*
School Address: 11 Sullivan Village, Easton, Pa.
Home Address: Same

Age 26, married, two children, draft status 5A. Courses include physical metallurgy, ferrous and nonferrous metallurgy, thermodynamics, foundry metallurgy, powder metallurgy. Experienced in gray iron foundry as core finisher, molder, coremaker. Desires ferrous or nonferrous foundry, development, or production, in that order. No territory preference. Available July 1.

**Warren Y. Dickert, Jr.**
*Degree Expected: B.S. in Met. Eng.*
School Address: Box 158, Lafayette College, Easton, Pa.
Home Address: 33 Belmont Ave., Quakertown, Pa.

Age 25, veteran. Courses include shop processes—foundry, principles of mining, physical metallurgy and chemistry, metallurgical engineering, metallurgy of iron and steel, materials testing, nonferrous advanced foundry and powder metallurgy, light metals, mineral dressing. Summer experience as boring mill operator, spot welder and aluminum fabricator. Prefers development or processing nonferrous and high-temperature metals related to aircraft industry. East preferred. Available June 30.

***FOR FURTHER INFORMATION about these graduates** Write direct to student or to head of metallurgy department or placement bureau at the school. See list on page 25 and 26.*

## Lafayette (Cont.)

**John H. Gross**
*Degree Expected: B.S. in Met. Eng.*

School Address: Sigma Nu, Lafayette College, Easton, Pa.

Home Address: 41 West Roseville Rd., Lancaster, Pa.

Age 24, single, 2nd Lt. in Reserves. Courses include ferrous and nonferrous metallurgy, physical metallurgy and chemistry, powder metallurgy, light metals, foundry, mineral dressing, thermodynamics, materials testing, mineralogy, crystallography. Prefers production or development work in ferrous metals. Any location. Available February.

**John J. Murphy, Jr.**
*Degree Expected: B.S. in Met. Eng.*

School Address: Phi Delta Theta, Lafayette College, Easton, Pa.

Home Address: 291 West Greenwood, Lansdown, Pa.

Age 26, single, veteran. Courses include ferrous and nonferrous metallurgy, advanced physical metallurgy, advanced foundry, physical chemistry, materials testing. Electronic technician in Navy. Technical societies, fraternity. "Who's Who Among Students in American Universities and Colleges". Nontechnical work experience. Desires work in production or sales. No specific territory desired. Available July 1.

**William J. Santo**
*Degree Expected: B.S. in Met. Eng.*

School Address: 24 Washington St., Bath, Pa.

Home Address: Same

Age 22, single, draft status 2S. Courses include ferrous and nonferrous metallurgy, physical metallurgy and chemistry, powder metallurgy, mineral dressing, quantitative and qualitative analysis, light metals, and mechanics, graphics. Technical, social activities. Has worked under combustion engineer in cement plant doing flue gas analysis as instrument technician, and as timekeeper and shipping clerk. Desires nonferrous work in West or Southwest, but not essential. Available June.

**Peter Schmey**
*Degree Expected: B.S. in Met. Eng.*

School Address: 28 Sullivan Village, Easton, Pa.

Home Address: Box 331, Portland, Pa.

Age 28, married, veteran, draft status 5A. Courses include physical, ferrous and nonferrous metallurgy, analytical mechanics, mechanics of materials, quantitative and qualitative analysis, geology, mineralogy, powder metallurgy, and materials testing. Fluent German. Experience includes three years as Counter-Intelligence Corps agent. Summer work in plastics color control laboratory, research project in core resins, foundry, radio announcer. Coast preferred. Available June.

**James W. Snyder, Jr.**
*Degree Expected: B.S. in Met. Eng.*

School Address: Phi Delta Theta, Lafayette College, Easton, Pa.

Home Address: 35 Center St., Forty Fort, Pa.

Age 21, single, draft status 1D. Courses include ferrous and nonferrous metallurgy, physical and powder metallurgy, metallurgy of iron and steel, foundry, light metals, mineral dressing, and materials testing. Technical societies. Assisted in core binder research program one summer. Prefers work with nonferrous extraction. No territory preference. Available after release from Army (approximately two years).

**William E. R. Watt**
*Degree Expected: B.S. in Met. Eng.*

School Address: 8 Sullivan Village, Easton, Pa.

Home Address: 953 President St., Brooklyn, N. Y.

Age 24, married, veteran. Courses include physical metallurgy and chemistry, metallurgy of iron and steel, light metals, nonferrous metallurgy, advanced physical metallurgy, thermodynamics, powder metallurgy, mineral dressing, mineralogy, physical and historical geology. Desires development and research, product development, or sales. Prefers work with high-temperature alloys or aluminum. Any location. Available June.

## Laval University

**Benoit Bernard**
*Degree Expected: B.S. in Met. Eng.*

School Address: 825 Madeleine de Vercheres St., Quebec, P. Q.

Home Address: 149 Tessier St., Rimouski Ouest, P. Q.

Age 27, single. B.A. degree in 1948. Courses include metallography, X-ray analysis, heat treatment, electrometallurgy, ore dressing, corrosion, physical chemistry, thermodynamics, resistance of materials. Speaks and writes French and English. Summer employment in copper smelter, in steel refining plant and in testing laboratory. Prefers work in production. Any location. Available May 15.

**R. Marc Lamarche**
*Degree Expected: B.S. in Met. Eng.*

School Address: 129 Garnier St., Quebec, P.Q.

Home Address: Box 103, Mont-Laurier City, P.Q.

Age 25, single, B.A. degree in 1948. Technical societies. Courses include metallography, X-ray analysis, heat treatment, electrometallurgy, ore dressing, corrosion, ferrous and nonferrous metallurgy, physical chemistry, thermodynamics, and related subjects. Speaks and writes French and English, writes Spanish. Quebec Department of Mines Scholarship. Summer experience in copper smelting, research on sponge iron and heat treatment of forgings. Desires work in physical metallurgy. Any location. Available May.

# *Laval (Cont.)*

**Roger Pinault**
*Degree Expected: B.S. in Met. Eng.*

School Address: 735 Ste. Foye Rd., Quebec, P.Q.

Home Address: Same

Age 26, married, one child. Studied advanced physical metallurgy, metallography, structure of metals, X-ray, metallurgy of iron and steel, electrochemistry, electrometallurgy, advanced physical chemistry and thermodynamics, ore dressing, mechanics and engineering materials, higher mathematics, economics, industrial relations and administration. Experience in aluminum industry, ore dressing research. Desires research in physical metallurgy. Any location. Available May 1.

# *Lehigh University*

**Helmut H. Brandt**
*Degree Expected: B.S. in Met. Eng.*

School Address: Beta Theta Pi, Lehigh University, Bethlehem, Pa.

Home Address: R. D. 20, Bethlehem, Pa.

Age 23, to be married after graduation, draft status 4A (Marine Corps veteran). Metallurgical courses prescribed. Technical, fraternal and social activities, sports. Worked over a year as chainman and fitter-helper in fabricating shop and two summers in research laboratory. Prefers sales or customer service. Any locality. Available July 1.

**Jean M. Emin**
*Degree Expected: M.S. in Met.*

School Address: (Write home address)

Home Address: Boite Postale 88, Casablanca, French Morocco

Age 25, single. Being drafted into French Army in March. Studied powder metallurgy and electrometallurgy. Former research assistant. Desires work as agent or representative after release from Army in November 1954.

**Thomas Leibinger**
*Degree Expected: B.S. in Met.*

School Address: 241 10th Ave., Bethlehem, Pa.

Home Address: Same

Age 24, married, veteran. Courses include ferrous and nonferrous metallurgy, physical chemistry and metallurgy, metallography, electrochemistry and metallurgy, qualitative and quantitative analysis, and personnel administration. Desires work in production or sales. East preferred, but not essential. Available July.

**John R. O'Ravitz**
*Degree Expected: B.S. in Met. Eng.*

School Address: 6 East 4th St., Bethlehem, Pa.

Home Address: 158 Holland St., Wilkes-Barre, Pa.

Age 24, married, veteran. Courses include ferrous and nonferrous production metallurgy, physical chemistry and metallurgy, metallography, electrochemistry and metallurgy, industrial metallurgy, industrial relations, industrial management. Summer experience in gray iron foundry. Prefers work in production metallurgy or technical sales. East preferred but not essential. Available July 1.

**Glenn W. Oyler**
*Degree Expected: Ph.D. in Met. Eng.*

School Address: R. D. #3, Bethlehem, Pa.

Home Address: Same

Age 29, married, two children, veteran, draft status 5A. B. S. in metallurgy from Penn State, M. S. from University of Pittsburgh. Thesis: "Cold Welding". Linde Air Products Co. Fellowship. Ph. D. Thesis: "Causes of Porosity in Sigma Welding". Five years experience as combination welder. Two years as welding research engineer. Desires welding research or development. Any location. Available June 15.

**Samuel D. Reynolds, Jr.**
*Degree Expected: B.S. in Met. Eng.*

School Address: 805 Delaware Ave., Bethlehem, Pa.

Home Address: 6 Benjamin West Ave., Swarthmore, Pa.

Age 21, single, draft status 2S. Subjects include advance iron and steel, electrometallurgy, industrial metallurgy, machine design, physical metallurgy and chemistry, qualitative analysis. A good background in nonferrous. Summer experience in nondestructive testing with special emphasis on X-ray and gamma ray radiography. Desires work in development, production, or sales. East preferred. Available July 1.

**Americo M. Santoro, Jr.**
*Degree Expected: B.S. in Met. Eng.*

School Address: 62 East Broad St., Bethlehem, Pa.

Home Address: Same

Age 23, single, Reserve officer in U.S.N.R. Courses include physical metallurgy, metallurgy of iron and steel, nonferrous metallurgy, calculations, electrometallurgy, metallography. Sports. Worked in openhearth and materials testing. Prefers production. Any location. Available August.

# *Lehigh (Cont.)*

**Jack K. Witherington**
*Degree Expected: B.S. in Met. Eng.*

School Address: Chi Psi, Lehigh University, Bethlehem, Pa.
Home Address: Bristol Rd., Holland, Pa.

Age 22, single, draft status 2S. Social, technical and student activities. Sports. Usual metallurgical subjects. Experienced as apprentice molder, core maker. Desires production metallurgy. No location preference. Available June.

# *McGill University*

**Dennis G. Hardy**
*Degree Expected: B. Met. Eng.*

School Address: 457 Argyle Ave., Westmount, P. Q.
Home Address: Same

Age 22, single. Courses include physical and extractive metallurgy, thermodynamics, electrometallurgy, mineral dressing, electrical engineering, metallography, mineralogy, design and thesis. Summer experience as third helper on openhearth, and laboratory work in petroleum and paint industries. Desires research or production, ferrous metals preferred but not essential. No territory preference. Available July 1.

**Leonard A. Mills**
*Degree Expected: B. Met. Eng.*

School Address: 3581 Lorne Ave., Apt. 8, Montreal, P. Q.
Home Address: Same

Age 26, married. Courses include thermodynamics, physical chemistry, physical and extractive metallurgy. Industrial experience includes four years in flotation operation and experimental work. Summers in chemical analysis and lead and tin dross treatment. Prefers production control and trouble shooting in process operation. Territory restricted to areas where housing is available. Available June 1.

# *Massachusetts Institute of Technology*

**Benjamin C. Allen**
*Degree Expected: M.S. in Met.*

School Address: 221 B. Graduate House, Cambridge, Mass.
Home Address: 520 Panmure Rd., Haverford, Pa.

Age 22, single, draft status 2S. Usual metallurgical engineering advanced courses. Social and technical societies. Two summers' work as laboratory assistant doing chemical analysis and routine tests with cast iron. Desires research work. Any location. Tentative plans to continue schooling.

# *University of Michigan*

**Kirk Q. Buddington**
*Degree Expected: B.S. in Met. Eng.*

School Address: 1010 Monroe St., Ann Arbor, Mich.
Home Address: 60 Scott St., Springfield, Mass.

Age 25, single, veteran. Courses include metallurgical engineering subjects. Experience consists of two years as chemical laboratory assistant in nonferrous foundry, part-time work in school foundry. Foundry Educational Foundation Scholarship. Desires work associated with foundry industry. No territory preference. Available June 15.

**Clyde E. Ingersoll**
*Degree Expected: B.S. Met. Eng. and B.S. in Chem. Eng.*

School Address: 2700 West Ellsworth Rd., Ann Arbor, Mich.
Home Address: 1721 South Westnedge, Kalamazoo, Mich.

Age 34, married, three children, veteran 40 months in AAF. Nine years experience in business and industry, including clerical, drafting, inspection of stampings, quality control (paper), sheet metal (roll, weld, shear, press sheet steel and monel). Two years part-time metallurgical research on dental alloys (gold and chrome-cobalt alloys). Prefers work in fabrication plant in Midwest or West. Available July 1.

**Julian I. Kycia**
*Degrees Expected: B.S. in Met. Eng. and B.S. in Chem. Eng.*

School Address: 1102 Oakland, Ann Arbor, Mich.
Home Address: 145 Bond St., Hartford 14, Conn.

Age 23, single, veteran. Courses include all prescribed work in chemical and metallurgical engineering besides extra courses in mathematics and welding. Prefers equipment or process development but will consider other work. Northeast preferred but not essential. Available July.

**James Pappas**
*Degree Expected: B.S. in Met. Eng. and B.S. in Chem. Eng.*

School Address: 1332 Geddes Ave., Ann Arbor, Mich.
Home Address: 135-22 116th St., Ozone Park, New York.

Age 24, married, draft status 4A. Courses include process design, equipment design, crystallography, X-ray study, physical metallurgy, ferrous and nonferrous metallurgy, cast metals and work with nodular iron. Technical societies. Desires work in nonferrous industry, production or developmental research. East preferred but not essential. Available June 15.

***FOR FURTHER INFORMATION about these graduates***
*Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on pages 25 and 26.*

## Univ. of Michigan (Cont.)

### Raymond B. Roof, Jr.
*Degree Expected: Ph.D. in Met.*

School Address: 1104 South Forest Ave., Ann Arbor, Mich.

Home Address: 149 College St., Battle Creek, Mich.

Age 23, married, draft status 2A(S). B. S. in chemical engineering 1951, B. S. in metallurgical engineering 1951, M. S. in metallurgical engineering 1952, all from University of Michigan. Graduate courses include high-temperature metallurgy, thermodynamics, explosives and X-ray analysis. Specialized in X-ray crystallography. Regent's Alumni Scholarship. Military activities. Laboratory assistant in chemistry for five years. Experience includes physical science aide, ballistics research, ordnance, research assistant, X-ray analysis. Desires teaching and/or research in X-ray crystallography in U. S. Available June.

### W. H. Strickler
*Degree Expected: B.S. in Met. Eng.*

School Address: 1923 Geddes Ave., Ann Arbor, Mich.

Home Address: 312 Michigan Ave., Frankford, Mich.

Age 20, single, draft status 2S. Courses include machining, metallurgy, personnel administration, production management, accounting, geology. Scholarship student. Technical societies. Two summers work in foundry, aluminum and ferrous. Desires work with nonferrous metals, North Midwest or West preferred. Available July 1.

### James F. Watson
*Degree Expected: B.S. in Met. Eng.*

School Address: 1125 Michigan St., Ann Arbor, Mich.

Home Address: 1122 Court St., Port Huron, Mich.

Age 21, single, draft status N.R.O.T.C. Courses include physical metallurgy, foundry practice, heat treatment. AFS Scholarship and Donovan Scholar. Experience in gray iron foundry, openhearth furnaces and research on nodular iron. Prefers production, research or sales work. No location preference. Available 1955.

### James A. Woodard
*Degree Expected: B.S. in Met. Eng.*

School Address: 315 North Prospect Ave., Ypsilanti, Mich.

Home Address: Same

Age 23, married, draft status 2S. Courses include physical metallurgy and metallurgical process design. Technical societies. Has worked summers in various factories. Desires work related to process difficulties and problems in nonferrous metallurgy. No territory preference. Available June 15.

***FOR FURTHER INFORMATION about these graduates***

***Write direct to student or to head of metallurgy department or placement bureau at the school. See list on pages 25 and 26.***

## Michigan College of Mining and Technology

### Ludolph Albers
*Degree Expected: B.S. in Met. Eng.*

School Address: 1307 Ruby, Houghton, Mich.

Home Address: 89-56 209th St., Bellaire, L. I., New York

Age 21, single, draft status 1D (R.O.T.C.) Courses include ferrous and nonferrous process metallurgy, advanced physical metallurgy, calculations, furnace design, instrumentation, foundry, alloy steels, applied heat treatment. Seminar: "Desulphurization of Steel in the Basic Openhearth Process". Summer work as openhearth observer. Desires work in production or sales with opportunity to advance into management. Location not essential. Available June 18.

### Robert E. Brown
*Degree Expected: B.S. in Met. Eng.*

School Address: 1010 Jasper Ave., Houghton, Mich.

Home Address: Same

Age 21, single, draft status 1D (R.O.T.C.) Courses include physical and process metallurgy, pyrometry, electrometallurgy, calculations, foundry, alloy steel and special ferrous alloys, principles of furnace design, construction and control, applied heat treatment, protective coatings. Technical society. Prefers work connected with electroplating. No territorial preference. Available June 1.

### Robert D. Carnahan
*Degree Expected: B.S. in Met. Eng.*

School Address: 1111 Jasper Ave., Houghton, Mich.

Home Address: 529 East 6th St., Blue Earth, Minn.

Age 21, single, draft status 2S. Subjects include pyrometry, thermal transition analysis, heat treating, foundry, ferrous and nonferrous physical metallurgy. Reports on "Electron Microscope" and "Shell Molding". Summer work doing research on high-temperature alloys. Experience as foreman in food packing plant and machine operator in metal stamping plant. Student assistant in metallurgy department. Honorary, technical societies. Desires work in sales or research and development. West preferred. Available June.

### Robert E. Goddard
*Degree Expected: B.S. in Met. Eng.*

School Address: 1513 East Houghton Ave., Houghton, Mich.

Home Address: 11301 South Longwood Dr., Chicago 43, Ill.

Age 22, single, draft status 1D. Courses include ferrous and nonferrous physical metallurgy, electrometallurgy, protective coatings, furnace control and design, pyrometry, heat treating, foundry, alloy steels, literature research on thermal etching of iron and steel. Fraternity, technical societies. Worked summers as draftsman and assistant quality controller on rolling mill. Prefers industrial or producing industry ferrous or nonferrous. Desires Midwest. Available June 8.

# Michigan Tech (Cont.)

### Frederick C. Hallgren
*Degree Expected: B.S. in Met. Eng.*

School Address: 1513 East Houghton Ave., Houghton, Mich.
Home Address: 9910 Schaefer, Detroit 27, Mich.

Age 24, single, draft status 2S. Courses include physical and process metallurgy, refractories, furnace design, heat treatment, foundry, advanced physical metallurgy, electrometallurgy, welding metallurgy. Research on periodic reverse current plating, engineering, and business law and psychology. President A.S.M. Chapter at the college. Desires producing industry in Midwest. Available June 8.

### James R. Lizenby
*Degree Expected: B.S. in Met. Eng.*

School Address: Box 47, Hubbell, Mich.
Home Address: Same

Age 21, single, draft status 2S. Courses include process and physical metallurgy, alloy steels, electrometallurgy, applied heat treatment, foundry, sales management, accounting, business law, marketing. College activities and fraternity. Summer work in copper smelter and zinc research laboratory. Prefers technical sales or producing industry. Cleveland area preferred. Available June 5.

### Muhammad Abdur Rashid
*Degree Expected: M.S. in Met. Eng.*

School Address: 302 Vivian St., Houghton, Mich.
Home Address: Outside Yakki Gate, Lahore, Pakistan.

Age 29, single. M.S. in chemical engineering 1950, B.S. in chemistry and physics 1947, both from University of Panjab, Lahore. Courses include X-ray, process metallurgy, advanced physical metallurgy, applied heat treatment, alloy steels, protective coatings, powder metallurgy, fire assaying, electrometallurgy, furnace design, pyrometry. Thesis: "Effect of Nitriding on Stainless Steel". Worked in Government Roads Research Laboratory at Lahore for seven months. Desires research, heat treatment or combination of chemical and metallurgical engineering, preferably Northeast or Midwest. Available June.

### Lloyd E. Rautiola
*Degree Expected: B.S. in Met. Eng.*

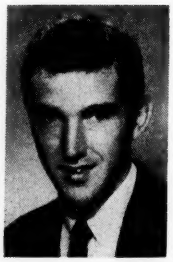
School Address: 446 Brayton Rd., Woodmar, Houghton, Mich.
Home Address: 1026 Second St., Hancock, Mich.

Age 21, married. Courses include physical and process metallurgy, pyrometry, electrometallurgy, refractories, foundry, protective coatings, X-rays, nuclear chemistry. Calumet and Hecla Inc. Metallurgical Engineering Scholarship. Who's Who Among Students in American Universities and Colleges. Fraternity. Summer work in analytical chemistry laboratory and as research metallurgist in cold extrusion. Prefers research. No location preference. Available June 1.

# Michigan State College

### Ronald H. Buck, Jr.
*Degree Expected: B.S. in Met. Eng.*

School Address: 6818 Brooklyn Rd., Jackson, Mich.
Home Address: Same



Age 20, single, R.O.T.C., two years active duty required upon graduation. Social, technical societies. State and Foundry Education Foundation Scholarship. Limited shop and foundry experience. Midwest desired. Available 1955.

### James F. Gaff
*Degree Expected: B.S. in Met. Eng.*

School Address: 1006-D Birch Rd., East Lansing, Mich.
Home Address: 719 Christy Ave., Jackson, Mich.

Age 31, married, two children. Inactive U.S.A.F.R. Three years industrial experience in tool design. Seven years as U.S.A.F. supply officer, including two years European occupation. Courses include physical and extractive metallurgy, mechanical and electrical engineering subjects, modern physics, physical chemistry. Worked one summer in industrial metallurgy laboratory. Officer in local A.S.M. chapter. Desires metals industry or research connection, North America or Europe. Available April 1.

### Wesley H. Hauschildt
*Degree Expected: M.S. in Met. Eng.*

School Address: 303c Hickory Lane, East Lansing, Mich.
Home Address: Same

Age 24, married. Two years in Marine Corps, draft status 4A. B.S. in metallurgical engineering 1952. Minor in geology. Honor fraternities, technical societies. Has worked in brass and aluminum casting company, iron foundry, forge plant in metallurgical laboratory. Desires research and development in cast metals. Eastern Seaboard or West Coast. Available September.

### William E. Kamradt
*Degree Expected: B.S. in Met. Eng.*

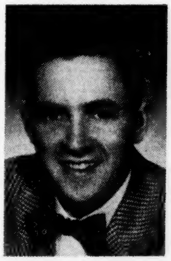
School Address: 903 East Grand River Ave., East Lansing, Mich.
Home Address: 110 Mary St., East Jordan, Mich.

Age 20, single, R.O.T.C. requires two years service. Courses include physical metallurgy, ferrous and nonferrous, chemical analysis, electroplating, electrical engineering, foundry, physics. Fraternity. Worked summers in jobbing foundry as molder, coremaker, and in sand laboratory. Prefers production work, research second. Midwest or East. Available in June for three months only.

# Michigan State (Cont.)

**William B. Larson**
*Degree Expected: B.S. in Met. Eng.*

School Address: 453 Abbott Rd., East Lansing, Mich.
Home Address: 2439 Highland Ave., Detroit 6, Mich.



Age 22, single. Will be commissioned in U.S.A.R. upon graduation. Courses include physical metallurgy, ferrous and nonferrous, extractive metallurgy, chemical analysis, thermodynamics, physical chemistry, atomic and nuclear physics, physics of metals. Fraternities. Prefers research or producing industry with nonferrous metals. No location preference. Graduates June 10.

**Ishwarbhai A. Patel**
*Degree Expected: Ph.D.*

School Address: 201 Olds Hall, East Lansing, Mich.
Home Address: 903 East Grand River, East Lansing, Mich.

Age 25, Indian, married. Chemical engineering major field, metallurgical engineering minor. Part-time employment by engineering experiment station at college. Prefers research or production in metallurgical industry. Available March.

**D. G. Trponi**
*Degree Expected: B.S. in Met. Eng.*

School Address: 1532 High St., Lansing, Mich.
Home Address: Same

Age 29, married, one child, veteran. Courses include powder metallurgy, high-temperature metals, heat treatment of steel, nonferrous metals. Four and one half years foundry experience as molder and coresetter. No location preference.

# University of Minnesota

**Jerome B. Malerick**
*Degree Expected: M.S. in Metallography*

School Address: 3408 Columbus Ave., Minneapolis, Minn.
Home Address: Same

Age 22, single, draft status 2S. Thesis: "Physical Metallurgy". Courses include physical metallurgy and chemistry, solid state physics, metallography, ferrous and nonferrous metallurgy. Technical societies. Experience as laboratory assistant with metallographic duties on research projects. Holds teaching assistantship. College activities. Desires production, research or development. No territorial preference. Available September.

# Missouri School of Mines and Metallurgy

**Reinhard P. Abendroth**
*Degree Expected: B.S. in Met. Eng.*

School Address: 206 West 9th St., Rolla, Mo.
Home Address: 6228 Oleatha, St. Louis, Mo.

Age 21, single, draft status 4F. Courses include metallurgy, foundry ore dressing, extractive processes, mathematics, physics. Honor fraternities, social and technical societies. Has worked in steel and malleable iron foundry. Prefers production or research. No territorial preference. Available July 1.

**Robert L. Crosby**
*Degree Expected: B.S. in Met. Eng.*

School Address: 606 Walnut, Rolla, Mo.
Home Address: 1733 South Douglas, Springfield, Ill.

Age 21, single, draft status 2S. Foundry Educational Foundation Scholarship. Usual metallurgical studies. Honor and technical organizations. No industrial experience. Prefers mineral dressing or foundry. South or West Coast preferred. Available June 1.

**Alfred S. Neiman**
*Degree Expected: B.S. in Met. Eng.*

School Address: 606 West 11th St., Rolla, Mo.
Home Address: 6620 Clemens Ave., University City 5, Mo.

Age 21, single, draft status 2S. Usual metallurgical courses. Honor, social and technical organizations. Has worked two summers in nonferrous smelter and steel foundry. Prefers work in process or foundry metallurgy of nonferrous metals or alloy steels. Midwest or South preferred, although not necessary. Available June 8.

**John H. Schemel**
*Degree Expected: B.S. in Met. Eng.*

School Address: 702 Park St., Rolla, Mo.
Home Address: Sandridge Rd., Alden, N. Y.

Age 21, single, reserve officer subject to call. Studies include process and extractive metallurgy. Technical, social, honor societies. Three summers in steel foundry. Top 5% of class. Prefers production or control work leading to supervisory position. Prefers not to work in South. Available June.

***FOR FURTHER INFORMATION** about these graduates Write direct to student or to head of metallurgy department or placement bureau at the school. See list on page 25 and 26.*

# New York University

**Lee E. Tanner**
*Degree Expected: B.S. in Met. Eng.*

School Address: 2226 Loring Place, New York 53, N. Y.
Home Address: Same.

Age 21, draft status 2AS. Subjects include thermodynamics, fluid mechanics, turbines and engines, strength of materials, kinematics, machine design, ferrous and nonferrous physical metallurgy, physics of metals, metals technology, metallurgical engineering. Thesis: "Titanium-Gold System". Professional societies. Worked as student mechanical engineer in naval shipyard. Available June 10.

# University of Notre Dame

**Clifford S. Barker**
*Degree Expected: Ph.D.*

School Address: Box 145, Notre Dame, Ind.
Home Address: 101 East North Shore Dr., South Bend, Ind.

Age 29, married, veteran, draft status 5A. B.S. degree from Carnegie Institute of Technology, M.S. degree from Notre Dame 1951. Thesis: "Titanium-Iron Alloys". Ph.D. Thesis: "Kinetics of Transformation of Au-Cu". Courses in diffusion, X-rays, extractive, powder and advanced physical metallurgy. Air Force and Union Carbide and Carbon Fellowships. Engineering representative. Worked for 18 months on metallurgical research and development nucleonics project. Desires research or development work. East preferred. Available August.

**August R. Freda**
*Degree Expected: B.S. in Met. Eng.*

School Address: 264 Alumni Hall, Notre Dame, Ind.
Home Address: 607 Carl Ave., New Kensington, Pa.

Age 21, single, draft status 2AS. Courses include general physical metallurgy, nonferrous and ferrous extractive metallurgy, ferrous and nonferrous physical metallurgy, phase diagrams, mineral dressing, X-ray metallography, physics of metals, mechanical testing. One year part-time work at University working on research, order-disorder problems. Summer work as quality control observer in alloy steel plant. Research metallurgy preferred. No location preference. Available June 15.

**Hubert B. Probst**
*Degree Expected: B.S. in Met.*

School Address: 206 Dillon Hall, Notre Dame, Ind.
Home Address: 321 North 33rd St., Louisville, Ky.

Age 22, single, draft status 1A. Courses principally in theoretical metallurgy. Especially interested in X-ray metallography, physical metallurgy, phase diagrams, ternary and binary. Three summers in foundry, metal forming, and metallurgical laboratory. One year part-time as research assistant while attending school. Desires research in physical metallurgy or production. Midwest preferred but not essential. Available June 15.

**David L. Sponseller**
*Degree Expected: B.S. in Met.*

School Address: 117 Alumni Hall, Notre Dame, Ind.
Home Address: 2415 9th St., N.W., Canton 8, Ohio

Age 21, single, N.R.O.T.C. Courses include ferrous and nonferrous physical metallurgy, mechanical testing, physics of metals, phase diagrams, casting and forming, ferrous and nonferrous extractive metallurgy, physical chemistry. Worked two summers as molder's helper in gray iron foundry. No work type preference. Northeast area desired. Active duty with Navy after graduation.

# Ohio State University

**Richard L. Heestand**
*Degree Expected: B.S. in Met. Eng.*

School Address: 125 West Ninth St., Columbus 1, Ohio
Home Address: 2517 South Freedom St., Alliance, Ohio

Age 23, single, draft status 2S. Courses include physical metallurgy, spectroscopy, alloy systems, corrosion. Fraternity and technical organizations. Four summers in physical testing laboratory, and work at university's Research Foundation in Corrosion. Desires position in research and development. No regional preference. Available July.

# University of Pennsylvania

**Herman S. Rosenbaum**
*Degree Expected: B.S. in Met. Eng.*

School Address: Box 291, U. of P. Dorms, 37th and Spruce St., Philadelphia 4, Pa.
Home Address: 41 South Madison Ave., Spring Valley, N. Y.

Age 20, single, draft status 2S. Courses include physical chemistry, thermodynamics, mechanical metallurgy. Honor, technical societies, dean's list. Experienced as laboratory technician doing metallography and testing. Desires research with opportunity for part-time graduate study. East preferred.

# Pennsylvania State College

**Alfred J. Babecki**
*Degree Expected: B.S. in Met.*

School Address: 134 South Frazier St., State College, Pa.
Home Adress: 129 East Green St., Nanticoke, Pa.

Age 27, married, one child, draft status 5A. Courses include chemical, physical, ferrous and nonferrous metallurgy, ferrous and nonferrous metallography, metallurgical investigations and engineering, electrical engineering, mineral dressing, industrial engineering, foundry technology, physical chemistry, technical writing. Worked one year as student technical laborer and one summer as industrial testing laboratory technician. Commercial heat treating and foundry operation in East or Northeast. Available July 6.

## Penn State (Cont.)

**David L. Douglass**
*Degree Expected: B.S. in Met.*

School Address: Box 476, State College, Pa.

Home Address: 32 Kendall Ave., Maplewood, N. J.

Age 21, married, draft status 2A. Courses include all basic metallurgy course plus advance physical, chemical and experimental metallurgy. Dean's list. Summer work in production and development heat treatment of steel (carburizing, nitriding, hardening). Laboratory assistant for junior metallurgy class. Departmental work on development and construction of spherical single crystal furnace and single crystal laboratory. Prefers nonferrous development and research. East preferred. Available July 1.

**Stanley Januszkiewicz**
*Degree Expected: B.S. in Met.*

School Address: 257 East Beaver Ave., State College, Pa.

Home Address: 1036 Beaver Ave., Ellwood City, Pa.

Age 37, married, one child, veteran. Courses include physical, ferrous and nonferrous metallurgy, metallurgical investigations, calculations, engineering, and refractories. Eight years experience in metallurgical laboratory as metallographer and test supervisor. Two and one half years in development, production, quality control of carbon, alloy and stainless tubular products. Desires ferrous research, development or production. Prefers East or Midwest. Available July.

**Charles E. Smeltzer, Jr.**
*Degree Expected: B.S. in Met.*

School Address: Box 481, Hamilton Hall, West Dorms, State College, Pa.

Home Address: York 8, Pa.

Age 21, single, draft status 2S. Courses include mineralogy, mineral preparation, geology, advanced physical and chemical metallurgy, ferrous and nonferrous extractive metallurgy and metallography, metallurgical investigations, introductory electrical engineering, atomic and nuclear physics. Worked summers in integrated plastics and die factory and a molybdenum and tungsten refinery. Worked as aide on school research project concerning temper brittleness of nickel-chromium steels. Honorary fraternities. Research or development work in East preferred. Available June.

**Frank R. Yurkoski, Jr.**
*Degree Expected: B.S. in Met.*

School Address: Box 579, Hamilton Hall, State College, Pa.

Home Address: Rt. 2, Box 222, Shickshinny, Pa.

Age 25, single, inactive Air Force. Subjects include ferrous and nonferrous metallurgy and metallography, chemical and physical metallurgy, mineral preparation, metallurgical investigations, foundry techniques and processes. Summer work at Naval Ordnance Laboratory as metallographer. Desires research or production work, preferably in East. Available June 15.

## University of Pittsburgh

**Bruce A. Giron**
*Degree Expected: B.S. in Met. Eng.*

School Address: 211 South Dithridge St., Pittsburgh 13, Pa.

Home Address: 309 Broad St., Jeannette, Pa.

Age 21, single, draft status 2S. Courses include heat treatment of steel, physical metallurgy, metallography, radiography, thermodynamics, machine design, strength of materials. Sports. Desires producing industry or sales work in ferrous field. East preferred but not essential. Available June 15.

**Michael D. Novotnak**
*Degree Expected: B.S. in Met. Eng.*

School Address: 130 East Schwab Ave., Whitaker, Pa.

Home Address: Same

Age 21, single, draft status 2A. Courses include physical, ferrous and nonferrous metallurgy, metallography, electrometallurgy. John M. Milliken Memorial Scholarship in senior year. Honor fraternity. Over two years experience in structural steel rolling mill. Prefers ferrous production or research work. East preferred but not essential. Available June.

**Dino Ravasio**
*Degree Expected: B.S. in Met. Eng.*

School Address: 117 Chess St., Monongahela, Pa.

Home Address: Same

Age 21, single, draft status 2S. Courses include physical and nonferrous production metallurgy, radiography, thermodynamics, electrical instruments, mechanical design, liquid steel control. State scholarship, dean's list. Honor fraternity. Summer employment in spring and axle plant. Desires production phase of ferrous industry. Any location. Available June 15.

## Polytechnic Institute of Brooklyn

**William B. Archey**
*Degree Expected: B. of Met. Eng.*

School Address: 85-99 Livingston St., Brooklyn 2, N. Y.

Home Address: 25 Lincoln Ave., Glen Head, N. Y.

Age 21, single, draft status 1A. Courses include physical chemistry and metallurgy, foundry, welding, machining, metallography, electrometallurgy, industrial economics and management. Thesis: "Properties of Carbon Nitrided Steels". Technical organizations. Desires production, development, or quality control work. New York area preferred but not essential. Available July 1.

## Brooklyn Polytech (Cont.)

### Joseph D. Chodrow
*Degree Expected: B. of Met. Eng.*

School Address: 85-22 213th St., Queens Village 8, N. Y.
Home Address: Same

Age 21, single, draft status 1A. Courses include general and industrial economics, business law, industrial radiography, thermodynamics, metallurgy of stainless steels, physical chemistry, welding and design, metallography of ferrous and nonferrous alloys. Chairman A.S.M. student chapter. Technical societies. Worked summers as inspector in welding research. Thesis: "Effect of Stress on Recrystallization Rate of Copper". Open to all inquiries in all locations. Available June.

### Carmine R. D'Antonio
*Degree Expected: B. of Met. Eng.*

School Address: 324 First St., Brooklyn, N. Y.
Home Address: Same

Age 21, single, draft status 4F. Studies include ferrous and nonferrous metallurgy and metallography, electrometallurgy, industrial metallurgy, welding and design, alloy steel metallography, stainless steels, design of castings, thermodynamics, industrial economics, chemistry, English. Thesis: "Preparation of Ductile Titanium Under High Vacuum". Desires work in production or process development, nonferrous. New York area preferred. Available October 1.

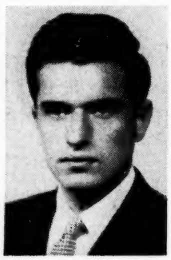
### Henry R. Penkava
*Degree Expected: B. of Met. Eng.*

School Address: 1333 First Ave., New York 21, N. Y.
Home Address: 67 Clintonville Rd., North Haven, Conn.

Age 24, single, draft status 4A, veteran. Studies include ferrous and nonferrous metallurgy and metallography, welding and design, powder metallurgy, steel heat treatment, chemistry, thermodynamics. Thesis: "Preparing Ductile Titanium by the Iodide Method". Experience as metallurgical laboratory technician, machine operator, clerk. Desires development or research work, preferably nonferrous. New England preferred but not essential. Available July 1.

### Anthony V. Sorrentino
*Degree Expected: B. of Met. Eng.*

School Address: 85 Carlton Ave., Brooklyn 1, N. Y.
Home Address: Same



Age 22, single, draft exempt. Courses include physical and process metallurgy, ferrous and nonferrous, theoretical and physical chemistry, ferrous and nonferrous metallography, electrometallurgy, alloy metallography, welding and design, production and industrial economics, pyrometry, strength of materials. Worked in local foundry, and as salesman, ran door-to-door laundry service. Social and technical organizations. Desires research, fabrication or sales, anywhere.

## Purdue University

### Stanley J. Block
*Degree Expected: B.S. in Met. Eng.*

School Address: 351 State St., West Lafayette, Ind.
Home Address: 7617 Phillips Ave., Chicago, Ill.

Age 21, single, draft status 2S. Courses include usual metallurgical engineering plus mineralogy, plastic metallurgy, X-ray technology, igneous solutions. Honor fraternities, technical societies. Industrial experience as laborer in steel mill. Prefers development or production. Available June.

### Louis Horvath
*Degree Expected: B.S. in Met. Eng.*

School Address: FPHA 310-2 West State St., West Lafayette, Ind.
Home Address: 517 Howe Ave., Shelton, Conn.

Age 29, married, veteran. Courses include physical metallurgy, ferrous and nonferrous metallography, corrosion, X-ray, advanced welding, statistical quality control. Worked in aircraft plant as assembler-fabricator, working with solid-state physics group on irradiation damage. Interested in development and sales. East or West Coast preferred but not essential. Available June.

### LeRoy Klingbeil
*Degree Expected: B.S. in Met. Eng.*

School Address: 131 Pierce St., West Lafayette, Ind.
Home Address: 5036 West 23 Place, Cicero 50, Ill.

Age 24, single, draft status 4A. Usual metallurgical engineering courses. Fraternities, sports. Has done foundry work, shell molding, selling and costing. Prefers production or sales in Chicago area. Available February.

### William E. Rogerson
*Degree Expected: B.S. in Met. Eng.*

School Address: 282 Littleton St., West Lafayette, Ind.
Home Address: 2947 Leachburg Rd., New Kensington, Pa.

Age 21, single, draft status 2S. Courses include ferrous and nonferrous metallurgy and metallography, physical metallurgy, plastics, igneous solutions, electrometallurgy, statistical quality control, business law. Worked one summer as metallurgical laboratory assistant and one summer as openhearth observer. Desires work in sales or sales engineering. Prefer East. Available June.

***FOR FURTHER INFORMATION* about these graduates** *Write direct to student or to head of metallurgy department or placement bureau at the school.* *See list on page 25 and 26.*

# Purdue (Cont.)

### Edwin D. Sayre
*Degree Expected: M.S. in Met.*

School Address: 418-2 FPHA, West Lafayette, Ind.

Home Address: Same

Age 27, married, one child. U.S.N.R., organized. Courses include process and physical metallurgy, theoretical physical metallurgy, cast iron, statistical quality control, foundry. Thesis: "Effects of Magnesium, Calcium, and Silicon on Pure Iron Carbon Alloys". Foundry Educational Foundation Scholarship. Fraternal, technical societies. Desires development work in foundry. East or South preferred. Available June.

### Ronald D. Sutton
*Degree Expected: B.S. in Met. Eng.*

School Address: 314 Russell St., West Lafayette, Ind.

Home Address: 408 North Superior St., Angola, Ind.

Age 22, single, draft status 2S. Majored in production metallurgy. Honor fraternities. Foundry Educational Foundation Scholarship, student activities. Prefers production.

### V. Herbert Ulrich
*Degree Expected: B.S. in Met. Eng.*

School Address: 427 State St., West Lafayette, Ind.

Home Address: 25 Ida St., Haledon, N. J.

Age 21, single, draft status 2A. Courses include mineralogy of ores, general metallurgy, physical chemistry and metallurgy, ferrous and nonferrous metallurgy, crystallography, plastic metallurgy, mechanical and electrical engineering, quality control. Technical societies. Desires work in quality control in foundry, or other secondary production plant. East preferred. Available June.

### Robert B. Warrick
*Degree Expected: B.S. in Met. Eng.*

School Address: 103 University St., West Lafayette, Ind.

Home Address: 209 South Green St., Brownsburg, Ind.

Age 21, single, draft status 1D, R.O.T.C. Courses include ferrous and nonferrous metallurgy and metallography, physical chemistry and metallurgy. Technical societies. Two summers work in malleable foundry. Desires ferrous foundry production in Midwest, or Northwest, although location is not essential. Available June.

### Richard W. Zieg
*Degree Expected: B.S. in Met. Eng.*

School Address: 501-1 FPHA, Purdue University, West Lafayette, Ind.

Home Address: 619 East Seminary St., Greencastle, Ind.

Age 21, married, one child, R.O.T.C. (two years service expected). Studied physical metallurgy and chemistry, ferrous and nonferrous, X-ray, general metallurgical courses. State Scholarship, Foundry Educational Foundation Scholarship. Technical societies. Two summers in malleable foundry. Prefers production engineering in small Midwest city or where suburban housing is available. Available from June until called to service.

### Dominic V. D'Amico
*Degree Expected: B.S. in Met.*

School Address: 140 Wellington St., Kingston, Ont.

Home Address: 68 Burgar St., Welland, Ont.

Age 26, married, one child. General metallurgical studies. One year's work in technical research, one year in melting control. Prefers production or sales, anywhere in U. S. or Canada. Available June.

### V. Harvey Polk
*Degree Expected: B.S. in Met. Eng.*

School Address: 237 Johnson St., Kingston, Ont.

Home Address: 86 Fifteenth St., Noranda, Que.

Age 21, single. Courses include physical metallurgy, thermodynamics, physical chemistry, electrometallurgy, extractive metallurgy. Experience in steel foundry, copper-zinc flotation, copper smelting. Desires ferrous producing industry. No geographical preference. Available June.

# Rensselaer Polytechnic Institute

### Richard A. Bosch
*Degree Expected: B. Met. Eng.*

School Address: 132 Oakwood Ave., Troy, N. Y.

Home Address: 27-14 163rd St., Flushing, N. Y.

Age 21, single, draft status 1A. Courses include physical metallurgy and chemistry, metallography, thermodynamics, nonferrous alloys, production metallurgy, welding processes. Summer work as process engineer at aircraft plant. Desires work in production or development. East preferred but not essential. Available June 15.

# Renssaelaer (Cont.)

**William A. Fragetta**
*Degree Expected: B. Met. Eng.*

School Address: 6 Sampson Ave., Troy, N. Y.
Home Address: 708 Rutger St., Utica, N. Y.

Age 21, single, draft status 1S(C). Courses include physical metallurgy and chemistry, electrometallurgy, thermodynamics, nonferrous alloys, metallography. Summer experience in materials testing laboratory on vacuum casting research. Some part-time work on magnesium research program at school. Interested in producing industry or research. No territorial preference. Available July 1.

**Henry Hahn**
*Degree Expected: M.S. in Met.*

School Address: 8-8 Edgehill Terrace, Troy, N. Y.
Home Address: 84-12 35th Ave., Jackson Heights, N. Y.

Age 25, married. B.S. degree from Massachusetts Institute of Technology. Summer work in industry, two years in research in phase diagram work and gas-metal reactions. Native languages German and Czech. Knowledge of Spanish and Russian. Desires research near New York City with opportunity for further education. Available August.

**John J. Harney**
*Degree Expected: B. Met. Eng.*

School Address: Clement 5, R.P.I. Dorms, Troy, N. Y.
Home Address: 1074 Congress St., Schenectady 3, N. Y.

Age 22, single, draft status 1S(C). Courses include physical metallurgy and chemistry, alloy steels, thermodynamics, electrometallurgy, ferrous metallurgy, metallography, welding processes and applications. Honor fraternity, campus activities. Two summers general work in electrical industry. Prefers production engineering in ferrous industry. Northeast preferred. Available June.

**Ivan M. Kerzner**
*Degree Expected: B. Met. Eng.*

School Address: 281 Hoosick St., Troy, N. Y.
Home Address: 612 Union Ave., Elizabeth, N. J.

Age 21, single, draft status 2S. Courses include physical, production and ferrous metallurgy, nonferrous alloys, electrometallurgy, thermodynamics, metallography, welding processes and applications. Industrial experience as junior engineer in production of secondary nonferrous metal alloys. Desires production of nonferrous alloys anywhere in U. S. Available June.

**Robert P. Meister**
*Degree Expected: B. Met. Eng.*

School Address: 329 Ontario St., Albany, N. Y.
Home Address: Same

Age 21, single, draft status 1S. Courses include physical metallurgy and chemistry, metallography, thermodynamics, electrometallurgy, nonferrous alloys, metal casting and forming. Prefers production or development work. East preferred but not essential. Available June.

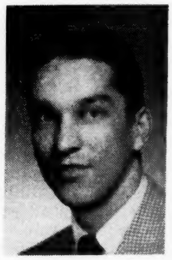
**Alan H. Miller**
*Degree Expected: B. Management Eng.*
*(Background in Metallurgy)*

School Address: LC 2 Dunn Garden Apartments, Troy, N. Y.
Home Address: 318 Holcomb St., Hartford, Conn.

Age 22, single, draft status 2AS. Studied time and motion studies, production planning and control, production management, production metallurgy, physical metallurgy, nonferrous alloys, ferrous metallurgy and engineering metallurgy. Technical, social organizations, sports. Two summers in aircraft plant. Prefers industrial engineering. Desires eastern U. S. Available June.

**Marvin L. Parrish**
*Degree Expected: B. Met. Eng.*

School Address: 217 Delaware Ave., Delmar, N. Y.
Home Address: Same



Age 24, married, veteran. Courses include physical chemistry and metallurgy, thermodynamics, alloy steels, electrometallurgy, metallography, ferrous production, welding processes and applications. One summer in precision casting research laboratory, one summer in high-temperature alloys research laboratory. Prefers metallurgical development work or work in a consuming industry. Midwest or Southwest U. S. preferred. Available June.

**Charles M. Pomeroy, III**
*Degree Expected: B. Met. Eng.*

School Address: DKE House, 2 Eaton Rd., Troy, N. Y.
Home Address: 105 Ransom Ave., Sherrill, N. Y.

Age 22, single, 2nd Lt., T.C., U.S.A.R., taking combined metallurgy and management engineering courses. Plans graduate work at Harvard School of Business Administration. Courses include metallography, physical metallurgy, nonferrous alloys, alloy steels, inspection of metals. Technical societies, college activities. Desires work in producing industry, preferably in marketing or administrative fields. No preference of location.

***FOR FURTHER INFORMATION about these graduates** Write direct to student or to head of metallurgy department or placement bureau at the school. See list on page 25 and 26.*

## Rensselaer (Cont.)

### John N. Ramsey
*Degree Expected: Ph.D. in Met.*

School Address: 5-2 Forsyth Dr., Troy, N. Y.
Home Address: Same

Age 30, married, veteran. B.S. in physics. Thesis: "Sintering With a Liquid Phase". Ph.D. Thesis: "Determination of the Chromium-Oxygen Equilibrium Diagram". Work includes study in X-ray diffraction, gases of extremely low partial pressures of oxygen, high vacuum, vacuum fusion system design and operation. Honorary societies. Published papers. Prefers research or research and development in physical metallurgy. Northeast preferred, won't consider south. Available Summer. Has Navy Security Clearance.

### Richard Z. Test
*Degree Expected: B. Met. Eng.*

School Address: 31 Belle Ave., Troy, N. Y.
Home Address: 27 South Main St., Elba, N. Y.

Age 21, single, U.S.N. Reserve commission, two years duty after graduation. Courses include metallography, physical and production metallurgy, electrometallurgy, nonferrous alloys, thermodynamics, business law, production planning and control, personnel management. Thesis: "Stress-Rupture of Aged Aluminum Alloys". Social and campus activities. Desires sales or production work in Northeast, Canada, or abroad. Available July 1955.

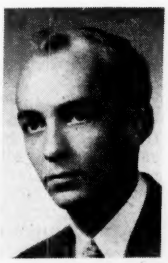
### Robert L. Ward
*Degree Expected: B. of Met. Eng.*

School Address: 1719 Highland Ave., Troy, N. Y.
Home Address: 20 Baldwin St., Watertown, Conn.

Age 21, single, R.O.T.C. Courses include physical metallurgy, electrometallurgy, alloy steels, nonferrous metallurgy, metallography, thermodynamics. Four-year tuition scholarship. Worked summers in textile industry. Prefers nonferrous industry. Northeast U. S. preferred but not essential. Available mid-June.

### Leslie S. Wilcoxson, Jr.
*Degree Expected: B. of Met. Eng.*

School Address: 1 Bolivar Ave., Troy, N. Y.
Home Address: Same



Age 24, married. Courses include physical and ferrous metallurgy, metallography, thermodynamics, alloy steels, electrometallurgy, mechanical behavior of materials. Summer work in research on carburization and boron steels. Interested in ferrous field, research and development. Northeast, Midwest or Far West. Available July 1.

## Ryerson Institute of Technology

### Frank J. Clement
*Degree Expected: Diploma in Met.*

School Address: 31 Birch Ave., Toronto 5, Ont.
Home Address: 62 Maple St., St. Catherines, Ont.

Age 21, single. Subjects include physical and production metallurgy, chemistry, welding technology. Thesis: "Sales". One year's experience in physical metallurgical laboratory, core room and foundry experience. Sport activities. Desires employment leading to sales position. Ontario vicinity preferable but not essential. Available May 15.

### John Makarchuk
*Degree Expected: Diploma in Met.*

School Address: 12 Huron St., Toronto, Ont.
Home Address: 362 Carlton St., St. Catherines, Ont.

Age 20, single. Subjects include physical and production metallurgy, chemistry, welding technology. One year experience in physical metallurgical laboratory. Thesis on "Physical Metallurgy". Scholarship from Ontario Chapter A.S.M. Sports. Production welding and shipyard welding experience. Would like to be accepted on training course by large company. Prefer Ontario territory but not essential. Available May 15.

## Stevens Institute of Technology

### Edward Dillingham
*Degree Expected: Mech. Eng.*

School Address: 530 Hudson St., Hoboken, N. J.
Home Address: 128 Bard Ave., Staten Island 10, N. Y.

Age 23, draft status 4F. Courses include materials, ferrous and nonferrous physical metallurgy, electron microscopy. Thesis for degree with high honor: "Correlation Between Light and Electron Microscopy as Applied to Steel". Experience in electronics research. Social, sport activities. Desires research on guided missiles or related fields. Prefer location on any seacoast. Available July 1.

### John D. Movius
*Degree Expected: Mech. Eng.*

School Address: 812 Castle Point Terrace, Hoboken, N. J.
Home Address: 811 Paris Ave., Rockford, Ill.

Age 22, single, draft status 2S. Courses in general engineering. Most interested in metallurgy, powder metallurgy. Dean's list. School, social activities. Graduate school lecture assistant, corrosion course, cathodic protection survey, design and installation. Desires research, design, development or field engineering anywhere. Available June 15.

## University of Utah

### John H. Dismant
*Degree Expected: Ph.D. in Met. Eng.*

School Address: 1505 A Parkway, Salt Lake City, Utah
Home Address: Same

Age 40, married, veteran. M.S. Thesis: "Decarburizing Cobalt by $CO_2$". Doctoral Thesis: "Differential Friction". Fellow Utah Engineering Experiment Station. Sixteen years experience, mainly mining and metallurgy, including nine months research engineer, two years professor of metallurgy, one year experimental engineer. Registered professional engineer. Honorary and technical organizations. Desires research or teaching in extractive metallurgy. Western U. S. preferred. Available Summer.

## University of Washington

### William K. Eggert
*Degree Expected: B.S. in Met. Eng.*

School Address: 1234 South 136th St., Seattle 88, Wash.
Home Address: Same

Age 25, married, draft status 4A. Courses include physical and extractive metallurgy, metallography, mineral dressing, flotation, light metal alloys, alloy steels, hardenability, nondestructive testing and radiography, basic accounting, humanities, background engineering, chemistry, physics. Thesis: "Temper Brittleness". Two years student engineering council. Experience includes administrative clerk, service, and steel plant chemical and spectrograph laboratory. One year as ultrasonic and pyrometric inspector. Prefers production problems with future in research. West preferred but not essential. Available August.

## University of Wisconsin

### Paul M. Benson
*Degree Expected: B.S. in Met. Eng.*

School Address: 1301 Chandler St., Madison 5, Wis.
Home Address: Same

Age 26, single, veteran. Courses include foundry, welding, production of steel and nonferrous metals, heat treatment, metallography, alloy steels, physical chemistry. Social, technical activities. Sports. Summer work as laborer in steel mill, foundry, lead and zinc extraction industry. Charge of quality control in foundry for six months. Prefers work in steel or malleable iron foundry. Midwest or West preferred. Available July 1.

### Robert R. Blackwood
*Degree Expected: B.S. in Met. Eng.*

School Address: 224 North Brooks St., Madison, Wis.
Home Address: 1704 East Kane Place, Milwaukee, Wis.

Age 24, married, veteran, draft status 4A. Studies include physical metallurgy, alloy structures, heat treatment of iron and steel, nonferrous metallurgy, iron and steel metallurgy, surface corrosion, X-ray, structure of solids. Desires ferrous or nonferrous production or sales. Technical societies. Experience in heat treating and production. Any location. Available February.

### John P. Frenck
*Degree Expected: B.S. in Met. Eng.*

School Address: 313 Chamberlin, Kronshage, Madison 6, Wis.

Home Address: 8507 Kenyon Ave., Wauwatosa 13, Wis.

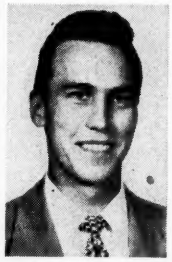
Age 21, single, draft status 2S. Courses include physical metallurgy, assaying, steel heat treatment, ferrous and nonferrous extractive processes, engineering expression, basic and advanced foundry metallurgy, X-ray studies, structures and uses of alloys. Technical societies. Two summers work in foundries and one in electroplating firm. Prefers foundry work in Midwest, though not essential. Available June 22.

### Richard D. Green
*Degree Expected: B.S. in Met. Eng.*

School Address: 302 Jones, Kronshage, Madison 6, Wis.

Home Address: 4373 North 52nd St., Milwaukee 16, Wis.

Age 24, single, draft status 2S. Courses include physical chemistry and metallurgy, calculations, ferrous and nonferrous extractive and productive metallurgy, foundry. Honorary fraternities, scholarship. Campus activities. Experienced in heat treating, foundry training, and foundry laboratory aide work. Desires production or quality control. Midwest or Southwest, not essential. Available July 1.



### Edward P. Wilkommen
*Degree Expected: B.S. in Met. Eng.*

School Address: 1827 Summit Ave., Madison 5, Wis.

Home Address: 2539 North 72nd St., Wauwatosa 10, Wis.

Age 23, single, draft status 1D, organized reserve. Studies include metallurgy of iron and steel, physical chemistry and metallurgy, metallography, heat treatment, extractive metallurgy, properties of alloys, mineral dressing, X-ray, spectrography. Summer experience in heat treating, forge shop, electroplating. Research project: "The Relation Between Austenitizing Temperature and Subsequent Hardenability of Some Boron Steels". Desires work in heat treating or extractive metallurgy. Prefers West. Available August 1.

## Washington State College

### Jack R. Miller
*Degree Expected: B.S. in Phys. Met.*

School Address: 1500 Reaney St., Pullman, Wash.

Home Address: 11611 12th, S.W., Seattle, Wash.

Age 21, married, draft status 1D (R.O.T.C.). Thesis: "Aluminized Iron". Studies include X-rays, physical chemistry and advanced physical metallurgy, nonferrous alloys. Social, honorary, technical organizations. Desires light metals research. No geographical preference. Available June 1.

## *Yale University*

**Howard W. Leavenworth, Jr.**
*Degree Expected: M. of Eng.*

School Address: 147 Circular Ave., Waterbury 4, Conn.
Home Address: Same

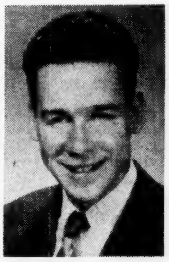
Age 24, single, deferred because of hearing. Thesis: "Surface Chemistry of High Speed Steel". Special interest in plastic deformation of metals. Degree of Mechanical Engineer from Stevens Institute of Technology 1947. One summer as metallurgist in aluminum company, three summers as machine designer. Desires research or development problems. Northeast preferred. Available June 10.

## *Youngstown College*

**Bernard L. Paluszak**
*Degree Expected: B.E. in Met. Eng.*

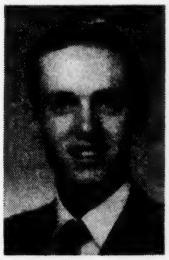
School Address: 128 West Kenneth Ave., New Castle, Pa.
Home Address: Same

Age 24, single, draft status 4A. Courses include chemistry, calculus, report writing, electrical engineering, general and physical metallurgy, metallography, ferrous and nonferrous metallurgy, fuels and furnaces, mechanical metallurgy. Honorary fraternity. Desires work in metallurgical engineering. No location preference. Available June.



**Eberhard L. Schuerer**
*Degree Expected: B. of Eng.*
*(Major in Metallurgy)*

School Address: R.F.D. 2, Hubbard, Ohio
Home Address: Same



Age 21, single. Courses include physical, iron and steel, mechanical, and nonferrous metallurgy, metallography, fuels and furnaces, advanced metallography. Assisted in metallurgical laboratory in preparation of metallurgical specimens for microstructural study. Worked part-time in seamless tube mill as observer, impartial ingot inspector.

### *FOR FURTHER INFORMATION about these graduates*

*Write direct to student or to head of metallurgy department or placement bureau at the school. See list on pages 25 and 26.*

## A Suggestion to Metals Review Readers:

*The preceding 24 pages of this special issue of Metals Review carry the Junior Member Placement Service inaugurated two years ago. In these pages appear photographs and qualifications of nearly 180 graduating metallurgists who will be available to industry between now and next summer.*

*In these days of manpower shortages, you could do your company a big favor by passing this special issue on to the employment or personnel manager, with a note calling his attention to the explanatory introduction on page 23.*

*This list of available young engineers is issued as a service to the metals industry by the American Society for Metals—the engineering society of the Metals Industry.*

THE EDITOR

# A. S. M. Review of Current Metal Literature

***An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month***

**Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio**

*Stewart J. Stockett, Technical Abstracter*

*Assisted by Claudia Belknap, Ardeth Holmes and Members of the Translation Group*

## A GENERAL METALLURGICAL

**12-A. Gold Recovery From Cyanide Solutions. New CRL Ion-Exchange Method Promising.** *Chemical Age,* v. 67, Dec. 6, 1952, p. 771.

Principles and operation of ion exchange method for gold recovery. (A8, C24, Au)

**13-A. Chromium Stainless Steels.** *Sheet Metal Industries,* v. 29, Dec. 1952, p. 1089-1091, 1094.

Questions and answers on problems associated with industrial use of Cr stainless. (A general, T general, SS)

**14-A. The Metallurgist and Metal Supply.** James Boyd. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 82-90.

Reserves of metals for the free world and the ways metallurgists can improve the situation. (A4)

**15-A. Metals for Defense in the ECA Countries.** Pierre van der Rest. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 91-99.

Potential contributions to defense of the free world. (A4)

**16-A. Metals for Defense in the Free World.** Clyde Williams. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 100-112.

Data on production of metals in the Free World. Includes tabulations. (A4)

**17-A. Metals Conservation and Substitution for Defense.** K. P. Harten. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 113-123.

Ways to conserve and extend metal supplies of the Free World. Cooperation by the various countries in developing and adopting replacements and in preventing waste. (A4)

**18-A. Mineral and Metal Industries of India.** Dara P. Antia. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 166-169.

India's mineral and metal production, imports, exports, metal needs, and factors affecting future development of her metal industries. (A4, B10)

**19-A. Metallurgical Education, Research and Development Work in Norway.** A. B. Winterbottom. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 294-297.

Aims and facilities. (A3, A9)

**20-A. The New Metals Age.** Lawrence P. Lessing. *Fortune,* v. 47, Jan. 1953, p. 109-115, 152, 154, 156-158, 160.

Development of metals industries from 16th century, including basic metals, chemical revolution in metals, alloys, light metals, alloy steels, rare metals, and refractory metals. Metals and alloys are tabulated in respect to physical properties and uses. Color photographs. (A2)

**21-A. Metals and Materials, Review and Forecast.** *Iron Age,* v. 171, Jan. 1, 1953, p. 278-285.

Economics of iron ore, refractories, and various nonferrous metals. 25 ref. (A4)

**22-A. Production Processes, Review and Forecast.** *Iron Age,* v. 171, Jan. 1, 1953, p. 286-305.

Latest advances in those processes that represent the heart of American industry. Among the 13 processes studied are: automation, casting, extrusion, forging, heat treating, machining, and metal finishing. Tables and diagrams. 76 ref. (A general)

**23-A. Tool Steel Directory.** *Iron Age,* v. 171, Jan. 1, 1953, p. 306-309, 311-312, 314-316, 318-320, 323-324, 326, 328, 330, 332-338, 342-344, 346-355, 358-368, 370-372, 375-382, 385-391.

Charts showing composition and mechanical properties, and forging and heat treating temperatures for most tool steels in U. S. and Canadian markets, plus a list of tool steel brands together with addresses of producers and distributors. (A10, TS, C-n)

**24-A. *The Iron Age* 1953 Metal Industry Facts.** *Iron Age,* v. 171, Jan. 1, 1953, p. 393-488.

Indexed, cross-indexed, reference section of statistical data on the following: steel industry, nonferrous metals, raw materials, metal products, casting and forging, machinery, market information, and labor. (A4)

**25-A. Directory of Carbides.** *Iron Age,* v. 171, Jan. 8, 1953, p. 109-110, 121-122.

Supplement to directory listings in Jan. 1, 1953 issue. Individual brands. (A10, C-n)

**26-A. Yugoslavia's Mineral Wealth—Largest Producer of Non-Ferrous Ores in Western Europe.** *Metal Age,* Dec. 1952, p. 3-7, 14.

Economic survey. Tables. (A4, B10, EG-a)

**27-A. Treatment of Metal Finishing Wastes.** Allen G. Gray. *Metal Progress,* v. 62, Dec. 1952, p. 77-81.

Treatment of cyanide waste, treatment of sludge, and treatment of Cr wastes with $SO_2$. Flow diagrams. (A8, L general)

*The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.*

**28-A. Metal Recovery by Ion Exchange.** C. F. Paulson. *Plating,* v. 39, Dec. 1952, p. 1330-1334, 1338.

Feasibility of recovering metals from chemical solutions in manufacturing and plating processes. Tables. 8 ref. (A8, L17, EG-a)

**29-A. 1953 Metalworking Facts and Figures.** *Steel,* v. 132, Jan. 5, 1953, p. 155-202.

Statistics published a year ago are continued and brought up to date. Raw materials through to end products of the metal consuming industries are covered, plus related subjects such as labor, prices, and earnings. Graphs and tables. (A4)

**30-A. 1953 Forum on Technical Progress in Metalworking.** *Steel,* v. 132, Jan. 5, 1953, p. 205-240, 242-244, 246, 249, 252, 254, 256-258, 260, 262, 264-266, 269-270, 272, 277-278, 280-282, 284, 286, 289, 292, 294, 296, 298-300, 303, 306, 308, 311-312, 314, 316-318, 320, 323, 326, 329, 332, 334, 336-338, 342, 345-347, 350, 353-354, 357, 360, 363, 366, 368-370, 372, 374, 376, 379, 382, 384, 386-387, 390, 392, 394, 397, 400, 402, 404, 406-407, 410, 413-414, 417, 420-422, 424, 426-429, 432, 434, 436, 438-440, 442-444, 447-448, 450-451, 454, 456, 458, 460.

Consists of articles on the following: steelmaking, nonferrous metal production, casting, materials and metallurgy, heat treating, inspection and testing, drives and controls, machining and tooling, forming, cleaning and finishing, joining and assembling, handling and packaging, lubrication, servicing and maintenance. (A general)

**31-A. Recent Experiments in the Recovery of Manganese.** Shadburn Marshall. "Yearbook of American Iron and Steel Institute", 1953, p. 289-306, disc., p. 306-307.

Experimental work done within last two years with AISI assistance and sponsorship has demonstrated that at least three processes for recovery of manganese from open-hearth slags are technically feasible. U. S. Bureau of Mines pyrometallurgical process, U.S.B.M. ammonium carbonate leaching process, and Mn recovery from slags by chloridization. Equipment is diagrammed and illustrated; data are charted and tabulated. (A8, D2, Mn)

**32-A. (Russian.) Problems of Replacing Nonferrous Metals and Alloy Steels.** B. Surikov. *Za Ekonomiiu Materialov,* Aug. 1952, p. 37-43.

Use of wood and plastics for bearings and other machine parts; use of less critical metals to save Sn, particularly for bearings; savings of Mo, Ni, Co in high-alloy steels by using lower alloy grades and surface hardening, and possibilities of Ti and Ti alloys which are in the laboratory stage. (A general)

**33-A.** (Russian.) **Improving the Utilization of Alloy Steels.** M. Begidzhanov. *Za Ekonomiiu Materialov,* Aug. 1952, p. 86-88.

Amounts of stainless and other high-alloy steels saved in various factories by using substitutes and improved manufacturing techniques. (A general, SS, AY)

**34-A.** (German.) **Future Problems of German Metal Supply.** Ferdinand Friedensburg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 5, Nov. 1952, p. 425-431.

Data on production and consumption in Germany. (A4)

**35-A.** (Book.) **Metallurgy for Engineers.** G. K. Ogale. 252 pages. 1952. United Book Corp., Poona, India. 10 rupees, 8 annas.

Textbook primarily intended for Indian metallurgical students. Stresses metallurgical developments in India. (A general)

**36-A.** (Book.) **Proceedings of the First World Metallurgical Congress.** William Marsh Baldwin, Jr., editor. 835 pages. 1952. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $10.00.

Covers Congress held in 1951. Includes 165 pages of nontechnical and semitechnical material (four articles of economic interest abstracted separately), an 84-page directory, and 51 technical papers under the broad headings of: mining, melting, and refining; fabrication, development, and application of metals; mechanical metallurgy; surface metallurgy; and physical metallurgy. Of the latter, eight were previously abstracted from versions published in *Metal Progress* during 1951. The others are abstracted separately in this issue. (A general)

**37-A.** (Book.) **The Statistical Yearbook, 1952. Tin; Tinplate; Canning.** 268 pages. 1952. International Tin Study Group, The Hague, Netherlands. $5.60.

Contains series of articles covering events of recent years in tin and tinplate industries and statistical account of tin, tinplate, and canning situation in 110 countries. (A4, Sn)

**38-A.** (Book.) **The Story of Mond Nickel.** A. C. Sturney. 63 pages. Mond Nickel Co. Sunderland House, Curzon St., London W.1, England.

Development of Mond Nickel Co.; includes sketches of past leaders. (A5, A2, Ni)

**39-A.** (Book.) **Yearbook of American Iron and Steel Institute.** 426 pages. 1952. The Institute, 350 5th Ave., New York 1, N. Y.

Covers 60th General Meeting, New York, May 1952. Lists officers and directors, program and proceedings, including talks on economic trends, government regulations, industrial relations, etc. Technical sessions on processing, research, and openhearths. Of the eight technical papers, and one economic paper, seven were previously abstracted from other sources. Abstracts of the other two appear in this issue.
(A4, A6, D general, Fe, ST)

# B

## RAW MATERIALS AND ORE PREPARATION

**15-B. Testing of Prospective Iron Ores.** H. U. Ross. *Canadian Mining Journal,* v. 73, Dec. 1952, p. 47-51.

Problems and tests involved in determination of ore. Blast furnace and its operation, chemical features, agglomeration, methods of beneficiation, crushing and screening, washing, jigging, heavy media sink-and-float methods, magnetic concentration and roasting, flotation, drying and calcining, and means of testing the ores. Photographs.
(B13, B14, B15, D1, Fe)

**16-B. Flame Radiation.** G. M. Ribaud, J. E. de Graaf, O. A. Saunders, and M. W. Thring. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 221-234.

Effects of different types of fuels, fuel energy input rates, atomizing agents, air-to-fuel ratios and quantities of atomizing agents on flame radiations. (B18)

**17-B. Table Flotation for the Removal of Sulphides From Tin-Wolfram Concentrates in Portugal.** J. C. Allan. *Bulletin of the Institution of Mining and Metallurgy,* v. 62, Dec. 1952, p. 81-90.

General discussion. (B14, Sn, W)

**18-B. Oxygen in Industrial Heating and Gasification.** *Coke and Gas,* v. 14, Dec. 1952, p. 437-442.

Use of $O_2$ in production of iron and steel and in manufacture of various fuel gases. (B22, B18, ST)

**19-B. Chuquicamata Sulphide Plant.** *Mining Engineering,* v. 4, Dec. 1952, p. 1175-1212.

Anaconda Mining Co's. plant at Chuquicamata, Chile. Separate articles as follows: "General Design—Sulphide Ore Plant", Wilbur Jurden; "Crushing Section", A. P. Svenningsen; "Concentrator Design", E. F. Raffo; "Concentrator Operation", D. S. Sanders and E. W. Witcomb; "Tailing Disposal", R. M. Kuralt; "Smelter Stacks", C. W. Dunham; "Piping", J. P. Manning; "Electrical Distribution", S. F. French; "Waste Heat Power Plant", B. F. Koch; and "Water Supply", W. E. Rudolph and B. E. Baylor. (B13, B14, C21, Cu)

**20-B. The Oxide Plant.** E. V. Herring and J. C. Allen. *Mining Engineering,* v. 4, Dec. 1952, p. 1212-1214.

Equipment and operation of Chile Exploration Co's. plant at Chuquicamata, Chile. (B14, Cu)

**21-B. Magnetic Roasting of Lean Ores.** Fred D. DeVaney. *Mining Engineering,* v. 4, Dec. 1952, p. 1219-1223.

General discussion of process developed by P. H. Royster. Charts and diagrams. (B15, Fe)

**22-B. The Effect of Heat Treatment and Certain Additives on the Strength of Fired Magnetite Pellets.** Strathmore R. B. Cooke and William F. Stowasser, Jr. *Mining Engineering,* v. 4, Dec. 1952, p. 1223-1230.

Factors responsible for strength of fired magnetite pellets, and effect of firing on magnetite pellets containing added CaO and MgO. Micrographs. (B16, Fe)

**23-B. Effects of Alkalinity on the Flotation of Lead Minerals.** Marston G. Fleming. *Mining Engineering,* v. 4, Dec. 1952, p. 1231-1236.

Fallacies of general theories of alkali depression, showing that operation depends upon nature of mineral-collector system involved. Three mechanisms of alkali depression, and limitations of critical pH as a fundamental factor in flotation. (B14, Pb)

**24-B.** (French.) **The Cobalt Industry in Haut-Katanga.** Georges Desbriere. *Revue de Metallurgie,* v. 49, Nov. 1952, p. 777-782.

Processes and equipment for extraction and refining Co in the Belgian Congo, as well as economical and geographical aspects of the problem. Photographs and charts. (B10, B12, B14, C general, A4, Co)

**25-B. White Pine Copper.** R. H. Ramsey. *Engineering and Mining Journal,* v. 154, Jan. 1953, p. 72-87.

Origin of the company, its organization, mill design, plan for mining, crushing, grinding, smelting, and power. Diagrams and photographs. (B13, B14, C21, Cu)

**26-B. Evaluation of the pH and Conductivity Methods of Slag Control.** P. D. S. St. Pierre. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 41-43.

Shows that although pH and conductivity measurements can indicate in a general way mineralogical development of a slag as heat proceeds, nature of hydrolysis of calic minerals precludes exact quantitative measurements. Micrographs, tables, and graphs. 5 ref. (B21)

**27-B. Study on Sintering of Iron Ores. I. Reducibility of Iron Oxide Materials.** Yoshikazu Takahashi. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 298-310.

Briquet samples containing $Fe_2O_3$, $SiO_2$, and CaO were heated at 1200 and 1300° C. in air or mixed CO and $CO_2$ so that Fe oxides might occur as hematite, magnetite, or wüstite. Samples were deoxidized with CO or $H_2$ at 900° C., and their reducibility, expressed as a value of comparative reducibility, was determined from their own reduction curves. Relation between reducibility and porosity. Graphs and tables. 19 ref. (B16, Fe)

**28-B.** (German.) **New Results With Pelletizing of Iron Ore Concentrates.** Georg Sengfelder. *Stahl und Eisen,* v. 72, Dec. 4, 1952, p. 1577-1579.

Report No. 63 of the Ore Committee of the Verein Deutscher Eisenhüttenleute giving results of production runs. Results are related to properties and reducibilities of the pellets. Photographs, charts, and tables. (B16, Fe)

**29-B.** (Book.) **Hydrometallurgy of Base Metals.** George D. Van Arsdale. 370 pages. 1953. McGraw-Hill Book Co. Inc., 330 W. 42nd St., New York 36, N. Y. $9.50.

Chemical, metallurgical and industrial aspects of recovering nonprecious metals from their oxidized ores by leaching. Covers Cu, Pb, Zn, Ni, Co, Mn, Sn, Sb, Cd, V and U. (B14, EG-a)

# C

## NONFERROUS EXTRACTION AND REFINING

**12-C. Chemico Metal Techniques.** William N. Porter. *Mining Congress Journal,* v. 38, Nov. 1952, p. 44-47.

Equipment and processes developed by Chemical Construction Corp. for the extraction and refining of Co, Ni, Cu, and Mn as powders which may make lower grade ores usable.
(C general, H10, Co, Ni, Cu, Mn)

**13-C. Reducibility of Zinciferous Ores.** E. Frenay. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 183-187.

Experiments were made on effects of $SiO_2$, zinc silicate, $Fe_2O_3$ on the rate of Zn extraction. (C21, Zn)

**14-C. Phosphorus Deoxidation of Molten Copper.** W. A. Baker. *Amer-*

*ican Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 268-293.
Experiments on nature and limits of deoxidation products, equilibrium distribution of $O_2$ and P, time to attain equilibrium, and disturbance of equilibrium under a charcoal cover. Data are tabulated and charted. (C21, Cu)

15-C. **Recent Advances in the Electrolytic Extraction of Manganese, Chromium and Cobalt.** J. W. Cuthbertson. *Chemistry & Industry,* Nov. 29, 1952, p. 1165-1170.
Deals with each individually. (C23, Mn, Cr, Co)

16-C. **Production Advancements in Titanium.** Charles Ayres. *Light Metal Age,* v. 10, Dec. 1952, p. 12-13.
Brief general discussion. (C general, Ti)

17-C. **The Production of Magnesium, Calcium, Tantalum, and Zirconium.** G. L. Miller. *Vacuum,* v. 2, Jan. 1952, p. 19-32.
Use of vacuum in production of specific metals on an industrial scale. Flow sheets. 10 ref. (C25, Mg, Ca, Ta, Zr)

18-C. **Electrometallurgy of Tin and Its Alloys.** E. S. Hedges and J. W. Cuthbertson. *Chemistry & Industry,* Dec. 27, 1952, p. 1250-1254.
Reviews electrolytes from which Sn is usually deposited. Electrodeposition of Sn, Sn refining by electrolysis, electrolytic detinning, electro-tinplate, and electrodeposition of Sn alloys. 14 ref. (C23, L17, Sn)

19-C. **On the Preparation of Magnesium Targets From MgO.** Leonard N. Russell, Warren E. Taylor, and John N. Cooper. *Review of Scientific Instruments,* v. 23, Dec. 1952, p. 764.
Brief description in which Ta strip was used for the reduction. (C26, Mg, Ta)

20-C. (German.) **How Can Shadings Be Avoided in Continuous Casting of Shapes?** W. Spielvogel. *Metall,* v. 6, Nov. 6, 1952, p. 693-695.
Practical suggestions for solving above problem, caused by fluctuations of feed pressure in hydraulic press installations. Diagrams and photographs. (C5, D9)

21-C. (German.) **Regarding the Refining of Metals by Intermetallic Reaction.** Wilhelm Dautzenberg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 5, Nov. 1952, p. 432-439.
Emphasizes importance of intermetallic reactions. Possibilities of preferential crystallization, especially in regard to Al refining. (C general, Al)

22-C. (Portuguese.) **Elimination of Low Arsenic and Antimony Contents From Lead by the Modified Harris Process.** Tharcisio D. de Souza Santos. *ABM Boletim da Associacao Brasileira de Metais,* v. 8, July 1952, p. 280-298.
Apparatus, procedure, and results of investigation. Tables and graphs. 9 ref. (C21, Pb, As, Sb)

23-C. (Portuguese.) **Preliminary Study on the Kinetics of the Harris Process Modified for the Special Purpose of Eliminating Low Arsenic and Antimony Contents From Dezinced Lead.** Tharcisio de Souza Santos. *ABM Boletim da Associacao Brasileira de Metais* v. 8, July 1952, p. 299-311.
Results of investigation. (C21, Pb, As, Sb)

24-C. (Portuguese.) **Preliminary Note on Obtaining Alloys With an Elevated Zinc and Silver Content by Liquation of Parkes Crusts.** Tharcisio D. de Souza Santos. *ABM Boletim da Associacao Brasileira de Metais,* v. 8, July 1952, p. 312-327.
Proposes a process by which Parkes method is improved, yielding a crust of 62-69% Zn, and 17-23% Ag. Data are tabulated. Micrographs. (C21, Zn, Ag)

25-C. (Portuguese.) **Results From Distilling Zinc-Silver Alloys With a Low Lead Content in Cast Iron Retorts in a Vacuum.** Tharcisio D. de Souza Santos, Luiz C. Correa da Silva, and José Martini. *ABM Boletim da Associacao Brasileira de Metais,* v. 8, July 1952, p. 328-348.
Results show that distillation for 6-8 hr. at 850-900° C. leads to almost complete recovery of Zn from the charge. Tables, graphs, and diagrams. (C22, Zn, Pb)

# D

## FERROUS REDUCTION AND REFINING

27-D. **Charging Open Hearth Furnaces.** C. Croxford. *British Steelmaker,* v. 18, Dec. 1952, p. 692-694, 709.
Study of scrap processing and furnace charging procedures in Northern France and Germany. Suggests ways to improve charging facilities in British openhearth melting shops. (D2, ST)

28-D. **Furnace Trends in Design and Operation.** Frank H. Slade. *Iron and Steel,* v. 25, Dec. 1952, p. 523-526.
Latest developments in blast furnaces, cupolas, rotary furnaces, high frequency furnaces, fume removal, and furnace control. (D general, E10)

29-D. **Injection of Oxygen-Reformed Natural Gas and Fuel Oil Into the Blast Furnace.** Julien O. Raick and James E. Brassert. *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 75-80.
Above procedure would double the output of existing blast furnace units and decrease coke rates to about one-half present values. Data are tabulated. (D1, Fe)

30-D. **Heating Up Open Hearth Furnaces After Rebuilding.** *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 113-117. (Based on a paper by Hobert M. Kraner and Charles N. Jewart.)
Developments at Lackawanna plant of Bethlehem Steel Co. (D2, ST)

31-D. **Timken Replaces Open Hearths With Electric Furnaces.** *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 139-140, 142, 145, 147.
Comprehensive discussion. Photographs. (D5, ST)

32-D. **Continuous Casting Makes Steady Progress.** *Steel,* v. 131, Dec. 22, 1952, p. 79, 82.
Developments by Republic Steel Corp. and Babcock & Wilcox Co. Recognition and control of six fundamental factors is the path to success for the much-discussed method. (D9, ST)

33-D. **Smelting Kuji Iron Sand by the Krupp-Renn Process.** Kenji Kuwada. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 188-198.
Economic and technical reasons for the success of the Krupp-Renn process at Kuji and properties of products. Data are tabulated. (D8, Fe, CN)

34-D. **The Use of Combustion Models in Open-Hearth Furnace Studies.** A. H. Leckie. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 206-220.
Results obtained on openhearth combustion models set up and operated by British Iron and Steel Research Association. Effects of air-to-fuel ratios, furnace pressures, and port design on heat transfer. Tables and charts. (D2)

35-D. **Operation of a Burner-Type Open Hearth.** Iwao Murata. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 235-240.
Design changes and operational results of converting an openhearth from mixed gas to cold coke-oven gas. Diagrams and tables. (D2)

36-D. **Cockerill Company's Experience With the Perrin Process.** J. Janvier, M. Nepper, and J. Levaux. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 241-246.
Experiences of John Cockerill Societe Anonyme, Seraing, Belgium, with the Perrin desulfurization process for basic openhearth steel. Furnace linings and deoxidation. (D2, ST)

37-D. **A Proposed Steel Making Process.** Alessandro Reggiori. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 256-259.
Scrap melting furnace and advantages of its use in conjunction with openhearths. (D2, ST)

38-D. **The Effect of Small Aluminum Additions on Alloy Steel.** Mario Signora. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 260-267.
Effect of small additions of Al made in the mold on Ni-Cr structural steel. Specimens taken from ingots were subjected to fracture and macroscopic tests while mechanical properties and McQuaid-Ehn tests were made on forgings. Tables and diagrams. (D9, M28, Q general, AY)

39-D. **A Statistical Analysis on the Formation of Corner Cracks in Steel Ingots.** Adolfo Antonioli. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 298-320.
Rapid pouring and high pouring temperature were found to be cause of cracks in carbon steel. Data are tabulated and charted. (D9, CN)

40-D. **Basic Electric Arc Steel Versus Acid Open Hearth Steel for Roller Bearings.** Bengl Kjerrman. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 502-505.
Causes of failures and relation to melting practice. Low $N_2$ content of acid openhearth steel makes it superior to basic electric. (D2, D5, T7, ST)

41-D. **Turbo-Blowers in Blast-Furnace Plants.** M. Haller. *Brown Boveri Review,* v. 39, May/June 1952, p. 189-199.
Important features of new axial-flow blower when used as a blast-furnace blower. (D1)

42-D. **The Brown Boveri Turbo-Blower in Large Steelworks.** *Brown Boveri Review,* M. Haller v. 39, May/June 1952, p. 200-206.
Conventional steelmaking processes in so far as they affect design of turbo-blower. (D general)

43-D. **Atlas to Continuously Cast Steel Billets, Slabs.** *Canadian Metals,* Dec. 1952, p. 18-19.
Process at Atlas Steels Limited, Welland, Ont., by which 10-15% more finished steel per heat than conventional pouring methods yield will be obtained. (D9, ST)

44-D. **Economics of Iron and Steel Melting.** Ralph L. Melaney. *Industrial Gas,* v. 31, Dec. 1952, p. 13, 20-24.
Procedures and costs of two gas-fired reverberatory furnaces, and a general description of openhearth firing. (D2, ST)

45-D. **Pacific Northwest Steel Plant in Commercial Operation.** Robert C.

Hill. *Steel,* v. 131, Dec. 29, 1952, p. 88, 90.

Electric furnace now melting carbon steel for 4x4-in. billets will shortly be scheduled on alloy and stainless grades at Seidelhuber Steel Rolling Mill Corp., Seattle. Photographs. (D5, CN, AY, SS)

**46-D. Timken Modern Electric Arc Furnace Features Original Inductive Stirrer Installation.** *Steel Equipment & Maintenance News,* v. 5, Dec. 1952, p. 8-9.

Brief description. (D5, ST)

**47-D. Carbon Refractories for Blast Furnaces.** John J. Hazel. "Yearbook of American Iron and Steel Institute", 1952, p. 309-351, disc., p. 352.

Experiences at various steel companies. Gas analyses were made from holes drilled at various locations to determine extent to which steam oxidizes the carbon blocks near the tap hole and cinder notch. Results of tests on different carbon raw materials and commercial grades of carbon blocks. Design of carbon hearths. Diagrams, tables, and graphs. Bibliography of 84 ref. (D1, Fe)

**48-D.** (French.) **Operation of Metallurgical Furnaces "Without Air."** Luis Pottecher. *Revue de Metallurgie,* v. 49, Nov. 1952, p. 811-814; disc., p. 814.

A study was made on the possibilities of operating blast furnaces with a $CO_2$-$CO$-$O_2$ mixture instead of air. Furnace design and advantages of the process. (D1, Fe)

**49-D.** (Swedish) **Söderberg Electrodes for Electric Steel Furnaces.** T. Wahlberg and N. Winblad. *Jernkontorets Annaler,* v. 136, No. 9, 1952, p. 377-411.

Investigations were made at three Swedish steel works. Coking temperatures for various pastes were determined. Causes of electrode breakage, manufacturing methods and care. Diagrams, tables, and graphs. (D5)

**50-D. Size Distribution as a Quality Factor of Blast-Furnace Coke.** J. Taylor and J. D. Gilchrist. *Engineering,* v. 174, Dec. 19, 1952, p. 805-807; Dec. 26, 1952, p. 838-840.

General discussion. Graphs and tables. (D1)

**51-D. Rammed and Castable Refractories Find Increased Steel Plant Use.** R. Russell Fayles. *Journal of Metals,* v. 5, Jan. 1953, p. 34-38.

Use for lining openhearth furnaces. Photographs. (D2)

**52-D. Use of Oxygen in the Production & Processing of Iron & Steel.** W. E. Krebs. *Journal of Scientific & Industrial Research,* v. 11A, Nov. 1952, p. 490-496.

Use of $O_2$ in welding and cutting surface treatment of iron and steel, in blast furnaces, in low shaft furnace, in openhearth heating, and in refining pig iron. 47 ref. (D general, K general, B22, CI, ST)

**53-D. Vanadium—The Possibility of Its Production From Indigenous Sources.** J. Sandor. *Metallurgia,* v. 46, Dec. 1952, p. 268-274.

Suggests carrying out iron and steelmaking operations for better extraction of V from the slag. Tables and diagrams. 11 ref. (D general, C21, V)

**54-D. Recent Experiences With the Smelting of Iron Ores in a Low-Shaft Furnace.** E. Killing. Henry Brutcher Translation 2938, 13 pages.

Previously abstracted from original in *Stahl und Eisen.* See item 348-D, 1952. (D8, Fe)

**55-D.** (German.) **Research on Solubility Relationships of Phosphoric Acid in Basic Bessemer Slag.** Siegfried Gericke. *Stahl und Eisen,* v. 72, Dec. 4, 1952, p. 1580-1583.

Effects of $SiO_2$ content on the solubility of $P_2O_5$ was studied on 330 samples. Data are tabulated and charted. 6 ref. (D3)

**56-D.** (Italian.) **Examination at the End of the Campaign of the Lining of an Open-Hearth Furnace Cooled With Fuel Oil.** G. Ziliani and G. Grungo. *La Metallurgia Italiana,* v. 44, Oct. 1952, p. 518-525.

Chemical, microscopical, and technological tests. Tabulated data. Micrographs. (D2)

**57-D.** (Book—German.) **(Blast Furnace Slags.) Hochofenschlocke.** Fritz Keil. 346 pages. 1952. Verlag Stakleisen, m.b.H., Dusseldorf, Germany. 32.50 DM.

Vol. 7 of the Stahleisen-Bücher series. Manufacture, properties, and applications of blast-furnace slags. (D1, Fe)

# E

## FOUNDRY

**27-E. Advantages and Disadvantages of Light Metal Melting Equipment.** Hiram Brown. *American Foundryman,* v. 22, Dec. 1952, p. 36-41.

Pit and tilt-type furnaces, stationary-type furnaces, induction furnaces, electromagnetic pumping, low frequency advantages, high frequency furnaces, lift coil furnace, melting pot compositions, cleaning Al pots, and pots for Mg. Diagrams and photographs. (E10, Mg, Al)

**28-E. Shell Molding and Coremaking Adapted to the Small Shop.** Wilbur S. Walters. *American Foundryman,* v. 22, Dec. 1952, p. 42-45.

Production and procedure for iron castings. Photographs. (E16, CI)

**29-E. Strong Aluminum Casting Alloys.** Donald L. Colwell. *American Foundryman,* v. 22, Dec. 1952, p. 60-65.

High strength in Al castings can be developed in certain alloys without heat treatment, saving production time and cost, and avoiding distortion which sometimes results during heating or quenching. Typical castings. How intermetallic compounds formed in the alloys promote the high strengths. Photographs, tables, and graphs. 11 ref. (E25, Q23, Al)

**30-E. Retriever Unloads Diecaster Automatically.** Robert E. Fromson. *American Machinist,* v. 96, Dec. 22, 1952, p. 100-101.

New automation device eliminates heavy handling of hot die-cast rotors, and operates in times sequence with die-casting machine and indexing slat conveyor. (E13, Al)

**31-E. Synthetic Resins in the Foundry.** D. N. Buttrey. *British Plastics,* v. 25, Dec. 1952, p. 410-415.

Urea and phenolic resins suitable for core binding, and procedures for satisfactory operations. (E18)

**32-E. Rotary Melting Furnaces.** *Machinery Lloyd* (Overseas Ed.), v. 24, Nov. 1952, p. 79-80.

New developments for melting or refining cast iron, steel, Cu, Al, and gunmetal. (E10, ST, CI, Cu, Al)

**33-E. Production of Serviceable Non-Ferrous Castings by Exploiting Mold-Reaction Effects.** W. A. Baker. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 321-324.

The prevention of shrinkage porosity in castings. (E25)

**34-E. Melting and Casting Aluminum Bronzes.** (Concluded.) James G. Dick. *Canadian Metals,* v. 15, Dec. 1952, p. 32, 34, 36.

Shrinkage and dross-forming characteristics, alloy composition, post-casting treatment, and effects of other elements in alloys. (E10, E25, Cu)

**35-E. New Precision Investment Foundry.** Ted Operhall. *Foundry,* v. 81, Jan. 1953, p. 86-93, 172, 174, 176, 178.

The investment casting process. Equipment and control measures being practiced at the Whitehall Division of Michigan Steel Casting Co. (E15)

**36-E. New Pressure Pipe Foundry Serves West Coast Area.** *Foundry,* v. 81, Jan. 1953, p. 98-101.

Plant layout and equipment for centrifugally casting iron pressure pipe at the United States Pipe and Foundry Co., Decoto, Calif. (E14, CI)

**37-E. The "Ideal" Steel Jobbing Foundry.** Harry G. Schlichter. *Foundry,* v. 80, Dec. 1952, p. 84-89, 251-262; v. 81, Jan. 1953, p. 102-107, 257-260.

Steps in modernizing a steel jobbing foundry. Facilities required to achieve efficient operations. Diagrams and photographs. (E general, CI)

**38-E. Effect of Raw Materials on Cupola Operation.** (Concluded) Bernard P. Mulcahy. *Foundry,* v. 81, Jan. 1953, p. 158, 160.

Effect on melt quality of equipment employed and manner of charging raw materials into the cupola. (E10, CI)

**39-E. Manufacture of Precision Patternplates.** Bernard Faure. *Foundry Trade Journal,* v. 93, Dec. 25, 1952, p. 723-727.

Basic principles and method of developing a system for carrying out production rapidly and economically on an industrial scale. Diagrams. (E17, CN)

**40-E. Synthetic Resins as Sand Bonds.** P. G. Pentz. *Foundry Trade Journal,* v. 93, Dec. 25, 1952, p. 729-733.

Characteristics and performance of current types of synthetic resin under actual foundry conditions, with emphasis on practical difficulties. Promising developments in characteristics of resins and methods of using them in the foundry. Graphs. (E18)

**41-E. How to Increase Your Diecasting Output.** L. F. Spencer. *Iron Age,* v. 171, Jan. 8, 1953, p. 93-98.

Better equipment enables castings to be made from Zn, Al, Mg, and Cu-base alloys. Equipment and die steels. Photographs and tables. (E13, Zn, Al, Mg, Cu, TS)

**42-E. Bakelite Resins for Shell Moulds and Cores.** *Machinery* (London), v. 81, Dec. 12, 1952, p. 1240-1241.

Brief discussion. (E18)

**43-E. Titanium and Zirconium Casting Now Practicable.** W. E. Kuhn. *Materials & Methods,* v. 36, Dec. 1952, p. 94-95.

New process by which castings ranging from several grams to several pounds can be produced by arc melting and casting. (E16, E10, Ti, Zr)

**44-E. High Speed Die-Castings.** *Metal Industry,* v. 81, Dec. 12, 1952, p. 466-470.

Examples emphasizing features of automatic pressure die casting of Zn and Zn alloys. (E13, Zn)

**45-E. Quality Considerations for Bronze Castings.** Harold J. Roast. *Metal Progress,* v. 62, Dec. 1952, p. 91-92.

Recent progress in the bronze foundry. (E general, Cu)

**46-E. Grain Refinement of Magnesium Castings.** R. T. Wood. *Modern Metals,* v. 8, Dec. 1952, p. 65-66, 68.

Grain refining method employed in Alcoa's Mg foundries. Tables. (E25, Mg)

**47-E. Large Magnesium Airframe Castings.** Ray Osbrink. *Modern Metals,* v. 8, Dec. 1952, p. 68-69.

Brief discussion. (E general, Mg)

**48-E. Magnesium Investment Castings.** P. L. Butler. *Modern Metals,* v. 8, Dec. 1952, p. 69-70.

Brief discussion on precision investment casting. (E15, Mg)

**49-E. Magnesium and the Shell Molding Process.** A. J. Marcotta. *Modern Metals,* v. 8, Dec. 1952, p. 70, 72.

Brief discussion. (E16, Mg)

**50-E. High Production Dielectric Core Baking Is Large Step Toward Improved Castings.** Lewis B. Reed. *Western Metals,* v. 10, Dec. 1952, p. 64-65.

Advantages. Photographs. (E21)

**51-E. The Effect of Moisture on the Amount of Dust Produced by Foundry Sand.** J. Bright and F. M. Shaw. *British Cast Iron Research Association, Journal of Research and Development,* v. 4, Dec. 1952, p. 426-429.

Summarizes series of tests carried out on a number of natural and synthetic sand mixtures in an attempt to establish minimum moisture content at which dust ceases to be generated by foundry sand. Tables and photographs. (E18)

**52-E. The Shell Moulding Process.** W. B. Parkes. *British Cast Iron Research Association, Journal of Research and Development,* v. 4, Dec. 1952, p. 445-452; disc., p. 453-456.

Process and pattern equipment, dump box, sand, resin, sand mixing, application and curing, stripping, assembly and pouring, gatings of castings, quality of castings produced, and shell cores. (E16)

**53-E. Heat Control in Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 81, Dec. 26, 1952, p. 1327-1332.

General discussion based on dies used with Zn-base alloys. Mention is made of BeCu inserts. (E13, Zn)

**54-E. The Mechanism of Nodular Graphite Formation in Cast Iron.** Isao Aoki. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 273-282.

When CuMg alloy is added to molten Fe, the alloy splits into small particles of liquid and is partially dissolved. When Si is added as inoculant, graphite precipitates on the undissolved particles and grows spherically. Micrographs. (E25, CI)

**55-E.** (Portuguese.) **Paints in Casting.** Carlos Dias Brosch. *ABM Boletim da Associacao Brasileira de Metais,* v. 8, July 1952, p. 225-233.

Use of paint for surface protection of molds and cores, for improving surface finish of castings, and for modifying surface structure of the cast metal. Micrographs and tables. (E19, E21, L26)

**56-E.** (Book.) **Investment Castings for Engineers.** Rawson L. Wood and Davidlee von Ludwig. 477 pages. 1952. Book Division, Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. $10.00.

The salient features, advantages and limitations of investment castings as they are employed in the metalworking industries. Present design and metallurgical limits are clearly defined, as are the degrees of cast tolerance control now commercially obtainable. Recent techniques, including the frozen mercury method. (E15)

# F

## PRIMARY MECHANICAL WORKING

**23-F. Britain's Latest Wheel Forge.** *British Steelmaker,* v. 18, Dec. 1952, p. 680-689, 691.

Rolling and dishing, the furnace, firing by heavy fuel oil, control by signal lamp, hydraulic descaling machine, operation of forging press, hydraulic valves in foundations, 1000-ton punching press, operation of rolling mill, transfer to dishing mill, five rim chilling stations, and turntable powered by 10 hp. motor. Photographs. (F22, CN)

**24-F. Forge for Continuous Production of Solid Railway Wheels and Disc Centers.** *Engineering,* v. 174, Dec. 5, 1952, p. 713-716.

General discussion of equipment at Tafford Park Steel Works, Manchester, England. (To be continued) (F22, CN)

**25-F. Cast Refractories Replace Brick in Heating Furnaces.** W. G. Patton. *Iron Age,* v. 170, Dec. 18, 1952, p. 140-141.

Installation and preliminary testing of new cast refractory material to replace brick in a barrel-type forging furnace. (F1)

**26-F. Investigation of the Piercing Process by Means of Model Wax Billets.** J. L. Holmquist. *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 53-65; disc., p. 65-68.

Experimental technique and apparatus used. Technique was applied only to the effect of the rate of reduction of section area on the magnitude and distribution of the deformations which occur in the piercing operation. Graphs, diagrams, and photographs. (F26)

**27-F. Developments in Electrical Drives for Steel Mill Applications.** W. R. Harris. *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 69-73; disc., p. 73-74.

Revamp of the 56 in. four-stand tandem cold mill at the Sparrows Point plant of Bethlehem Steel to a five-stand tin-plate mill. Layout of the main drive equipment for 45-in. universal slabbing mill and drive layout of the 80-in. hot strip mill at the Fairless plant of U. S. Steel. Diagrams. (F23, ST)

**28-F. Plate Qualities Required in Can Manufacturing.** S. L. Flugge. *Iron and Steel Engineer,* v. 29, Dec. 1952, p. 127-129; disc. p. 129-130.

Future developments in sterilization and production methods which may allow lighter weight Sn plate stock to be used. (F23, L17, CN, Sn)

**29-F. Aluminum Forgings "Coming of Age".** Walter Rudolph. *Modern Industrial Press,* v. 14, Dec. 1952, p. 13-14, 16, 18.

Pictorial description of Aluminum Forge Div., Willys-Overland Motors, Inc., Erie, Pa. (F22, Al)

**30-F. Cold Extrusion of Steel.** *Modern Industrial Press,* v. 14, Dec. 1952, p. 40, 44, 46, 50, 52, 54.

Advantages and latest developments. (F24, ST)

**31-F. The Use of Crystallography in the Development and Manufacture of Diamond Tools.** G. E. Shubrooks, and H. P. Gifford. *Wire and Wire Products,* v. 27, Dec. 1952, p. 1288-1290.

Emphasizes the possibility of tripling life of diamond tools, including wire drawing dies, through a proper selection and orientation of the stones. Diagrams. (F28, C-b)

**32-F. Silver Wire—Its Cold Working and Annealing.** M. Baliki. *Wire and Wire Products,* v. 27, Dec. 1952, p. 1291-1296, 1313.

Experimental data and results. (F28, J23, Ag)

**33-F. Pontiac Cold-Extrudes Rocket Projectiles.** Ben C. Brosheer. *American Machinist,* v. 97, Jan. 5, 1953, p. 118-120.

One of the first successful applications of cold extrusion of steel parts on a production-line basis worked out by Pontiac production and tool engineers for producing 4.5-in. rocket nose pieces. Diagram and photograph. (F24, ST)

**34-F. 75,000-Ton Throatless Forging Press Being Planned for Future Planes.** Rupert LeGrand. *American Machinist,* v. 97, Jan. 5, 1953, p. 122-124.

Throatless press concept, optical alignment including press features, dies, nonforging uses, working the press, ease of manufacture, and economy of construction. (F22)

**35-F. The Cause of Check Marks on Copper Wire.** B. I. Ström and B. G. Waller. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 338-354.

An extensive study was made of tough pitch Cu. Size of surface defects, furnace atmosphere, and tensile stress were found to be important factors. (F28, Cu)

**36-F. Modernization of an Old Draw-Bench for Cold Drawn Bars.** Nils L. Gripenberg. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 355-360.

Measures accomplished in spite of severe shortages of equipment and funds. (F27, ST)

**37-F. New Application of Old Principle Simplifies Forging.** *Canadian Metals,* v. 15, Dec. 1952, p. 50-51.

Electro-forge machine using electrical resistance heating adaptable to low cost production of many small steel parts, from simple gear blanks to complex axle shafts. (F22, CN)

**38-F. American Equipment Increases Britain's Steel Output.** *Iron Age,* v. 170, Dec. 25, 1952, p. 74-77.

New continuous mills built at cost of $70,000,000 antiquating pack-mills of South Wales. Former output of 200-300 boxes of tinplate per week has been raised to 140,000 boxes per week. Photographs. (F23, CN)

**39-F. Big Presses Tax Design Ingenuity.** M. D. Stone. *Iron Age,* v. 171, Jan. 8, 1953, p. 99-103.

Design and mechanism of new hydraulic die forging and extrusion presses sponsored by the U. S. Air Force. (F22, F24)

**40-F. Ingot Heat Conservation. I. Time Studies From Casting to Rolling.** A. V. Brancker, J. Stringer, and L. H. W. Savage. **II. Mould and Ingot Surface Temperatures.** A. V. Brancker. **III. Mould Temperature Measurements.** R. T. Fowler and J. Stringer. *Iron & Steel,* v. 25, Dec. 12, 1952, p. 565-577.

Diagrams and tables. (F21, ST)

**41-F. The Rolling of Precision Rounds in the U.S.A.** R. Stewartson. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 419-426.

Analyses of factors enabling some American mills to produce high-quality rounds. Types of mills, billet preparation and heating, mechanical features, vertical precision rolls, and pass design. Tables and diagrams. (F23, AY)

**42-F. Fabrication of Beryllium Metal.** E. Creutz and D. Gurinsky. *Metal Progress,* v. 62, Dec. 1952, p. 82-84.

Extrusion, forging, and welding of Be. (F22, F24, K general, Be)

**43-F. Scale on Steel. With Particular Reference to Drop Forgings.** D. H. Lee-Bird. *Metal Treatment and Drop Forging,* v. 19, Dec. 1952, p. 533-536, 539.

Losses due to scale, scaling tests, effect on furnace bottoms, and descaling methods. Photographs and diagrams. (F22, R2, ST)

**44-F. Extruding Aluminum in Giant Presses.** T. F. McCormick. *Modern Metals,* v. 8, Dec. 1952, p. 54, 56-57.

Problems that could arise in the operation of 13,200-ton press now being installed in Alcoa's Lafayette Works. (F24, Al)

45-F. **Fontana's Tin Mill Roll Shop.** *Western Machinery and Steel World,* v. 43, Dec. 1952, p. 82-84.
Operation at above plant which has capacity of 200,000 tons of tin plate per year. Photographs. (F23, CN)

46-F. **Huge Forgings in the Northwest.** *Western Machinery and Steel World,* v. 43, Dec. 1952, p. 108-109.
Steel forging operations at Isaacson Iron Works of Seattle. Photographs. (F22, ST)

47-F. **"Gargantua" Forge Press Forms 4-Ton Shaft.** Robert T. Reinhardt. *Western Metals,* v. 10, Dec. 1952, p. 63.
(F22)

48-F. **Forge for Continuous Production of Solid Railway Wheels and Disc Centres.** (Concluded.) *Engineering,* v. 174, Dec. 12, 1952, p. 752-754.
Rolling mill, 2000-ton dishing press, rim-chilling machine, and motor and pump room. Photographs. (F22, F23, CN)

49-F. (Russian.) **Rolling of Metals With Minus Tolerances.** N. Gavrilenko and I. Kuzema. *Za Ekonomiiu Materialov,* Aug. 1952, p. 31-36.
Savings possible by this method. Data are tabulated. (F23)

50-F. **Cold Extrusion Saves Time and Material in Making Rocket Elements.** Joseph Geschelin. *Automotive Industries,* v. 108, Jan. 1, 1953, p. 62-65.
Steps involved in extruding SAE 1015 steel at Pontiac Motor Division, General Motors Corp. (F24, CN)

51-F. **A Note on the Back-Pull Factor in Strip-Drawing.** R. Hill. *Journal of the Mechanics and Physics of Solids,* v. 1, Jan. 1953, p. 142-145.
Theoretical analyses which is compared with previous theories. 7 ref. (F23)

52-F. **Forging of Arc-Melted Chromium.** H. L. Gilbert, H. A. Johansen, and R. G. Nelson. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 63-65.
Hydrogen-reduced electrolytic Cr powder may be arc-melted to prepare ingots for forging, rolling, or swaging to desired form. Finished forms exhibit ductility at considerably lower temperature than heretofore described. 9 ref. Photographs. (F22, Cr)

53-F. **General Facts About the 35,000 and 25,000-Ton Forging Presses.** E. A. Irwin. *Machine and Tool Blue Book,* v. 49, Jan. 1953, p. 170-174, 176.
Presses being built for production of Al and Mg forgings for the aircraft industry. (F22, Al, Mg)

54-F. **Separation of Shell Billets by the Shear-Fracture Method.** W. C. Tucker. *Machine and Tool Blue Book,* v. 49, Jan. 1953, p. 178-180, 182, 184, 186.
Merits of using the method and characteristics to be watched for. Discussion follows U. S. Army and Navy Ordnance specifications. Diagrams and photographs. (F29, ST)

55-F. **Bronx Continuous Tube Forming and Welding Machine.** *Machinery* (London), v. 82, Jan. 2, 1953, p. 27-29.
Machine which continuously welds ½ to 2½-in. tubing. (F26, CN)

56-F. **Push-Button Controlled Wheel Forging and Rolling Plant.** *Metallurgia,* v. 46, Dec. 1952, p. 275-280.
Addition of mechanical handling in the Trafford Park works of Taylor Bros. and Co. Ltd., which increased production and decreased man-hours. Photographs. (F22, F23)

57-F. **Low Frequency Induction Heater.** *Metallurgia,* v. 46, Dec. 1952, p. 281-282.
Use for heating light alloy billets. (F21, Al, Mg)

58-F. **Paper-Thin Metals. Availability Stimulates Design.** Monroe Sherman. *Product Engineering,* v. 24, Jan. 1953, p. 138-141.
Metals that can be rolled to 0.0005 in. and to tolerances as close as ±0.0001 in. are Al alloys, Cu-base alloys, ferrous metals, Ni-base alloys, high-temperature alloys, Mo, Ta, Ti, Zr, and precious metals. Rolling techniques. (F23)

59-F. **Two Way Press Produces High Pressure Parts.** *Steel,* v. 132, Jan. 12, 1953, p. 66-69.
Forging press which has main vertical ram of 5000 tons capacity and two horizontal rams of 2000 tons capacity. Techniques developed broaden field of shapes and patterns possible from steel and alloys. Photographs and diagrams. (F22, ST)

60-F. **High-Pressure Pipework Fabrication.** G. Poole. *Welding and Metal Fabrication,* v. 21, Jan. 1953, p. 13-16.
New plant, equipment, and fabrication procedures at Parsons & Co., Ltd., Heaton Works. Includes forming, heat treating, welding, and inspection. Photographs.
(F26, J general, K general, CN)

61-F. (Book-German.) **(The Principles of the Rooling Process.) Grundlagen des Walzverfahrens.** H. Hoff and T. Dahl. 296 pages. Verlag Stahleisen m.b.H., Düsseldorf, Germany. 29.00 DM.
Theoretical principles involved in process of rolling metals. Although main emphasis is on steel, rolling of other metals and alloys is also dealt with. (F23, ST)

# G

## SECONDARY MECHANICAL WORKING

37-G. **How Oak Ridge Machines Beryllium.** J. M. Case and E. R. Watkins. *American Machinist,* v. 96, Dec. 22, 1952, p. 93-97.
Unusual precautions taken to protect workers from Be poisoning, plus the latest data on deep-hole drilling, milling, and other machining operations. (G17, A7, Be)

38-G. **Stretch Forming Machine Shapes Extruded Aluminum Parts.** *Iron Age,* v. 170, Dec. 18, 1952, p. 137-139.
A 60-ton stretch forming machine for Al alloy aircraft components, eliminates routing, blanking, or sawing operations on flat sheared stock. (G9, Al)

39-G. **Production Costs Lowered With Pre-Coated Coil Stock.** Arthur E. Uhleen. *Iron Age,* v. 170, Dec. 18, 1952, p. 145-147.
Use of precoated steel coil for stamping, piercing, intricate embossing, and deep and severe drawing. Savings and advantages.
(G3, G4, ST)

40-G. **Calculations on the Influence of Friction and Die Geometry in Sheet Drawing.** A. P. Green and R. Hill. *Journal of the Mechanics and Physics of Solids,* v. 1, Oct. 1952, p. 31-36.
Calculations of drawing stress for sheet drawing for both smooth and rough wedge-shaped dies. Results are summarized in convenient empirical formulas. (G4)

41-G. **Cold Strip Forming. Parts I and II.** J. A. King *Sheet Metal Industries,* v. 29, Nov. 1952, p. 999-1002, 1008; Dec. 1952, p. 1092-1094.
Equipment and advantages of the process. Photographs and diagrams. (G1)

42-G. **Deep Drawing Sheet Steel.** E. M. H. Lips and F. J. H. Rolink. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 391-404.
Shows that drawability of metals can be predicted from tensile test data using reduction of area, yield strength, elongation, and the strain hardening parameter. Equations are derived and data charted. (G4)

43-G. **Experts Analyze Heavy Press Problems.** Irving Stone. *Aviation Week,* v. 58, Jan. 5, 1953, p. 20-21, 23-24, 27-28, 33-34, 38.
Advantages of integral construction and fabrication advances. Use of Al and other alloys. Diagrams and photographs. (G1, Al)

44-G. **Colloidal Graphite and Metal Forming.** *Canadian Metals,* v. 15, Dec. 1952, p. 52, 54.
Uses in metalworking industry. Properties are cited as excellent lubrication, high thermal and electrical conductivity, resistance to very high temperatures, and exceptional chemical stability towards most reagents. (G21, F1)

45-G. **External Dust Control for a Pedestal Grinder. Parts I and II.** W. H. White and W. B. Lawrie. *Foundry Trade Journal,* v. 93, Dec. 4, 1952, p. 641-645; Dec. 11, 1952, p. 673-682.
Experimental work which led to construction of a protype and dust estimations made on it. Movement of dust clouds, both with and without local exhaust ventilation was recorded. Part II: Various parts of the apparatus. Photographs, diagrams, and tables. (G18, A8)

46-G. **New Auxiliary Tool Makes Manual Flame Cutting Easier.** *Industry & Welding,* v. 26, Jan. 1953, p. 56-57.
Brief description. (G22)

47-G. **Machining—Theory and Practice.** K. G. Lewis and W. Milne. *Machinery,* (London), v. 81, Dec. 12, 1952, p. 1231-1236, 1247.
Essential characteristics of tool materials, wear of tungsten carbide tools, super high-speed metal cutting, methods of improving wear resistance, and "hot machining". 16 ref. (G17, TS)

48-G. **Spun and Drawn Zinc Parts Have Many Applications.** Ernest V. Gent. *Materials & Methods,* v. 36, Dec. 1952, p. 102-104.
Drawing, spinning, and finishing Zn articles. (G4, G13, L general, Zn)

49-G. **Cooled Oil Jets For Cutting Tools Promise Increased Machinery Efficiency.** Leo Walter. *South African Mining and Engineering Journal,* v. 63, pt. II, Nov. 29, 1952, p. 525, 527.
Procedure and advantages. Diagrams. (G21)

50-G. **Cold Heading as a Method of Fabrication. Part II.** Lester F. Spencer. *Steel Processing,* v. 38, Dec. 1952, p. 602-606, 630.
Advantages of cold heading for production of articles from various ferrous and nonferrous metals. 11 ref. (G10)

51-G. **Cutting Forces and Temperatures When Milling With Carbide Cutters.** H. Opitz and J. Kob. *Tool Engineer,* v. 30, Jan. 1953, p. 35-41.
Speed and feeds, design factors, test procedures using SAE 1010 and SAE 1035 steels, chip formation, economy of operation, and tool vibrations. Graphs and micrographs. 6 ref. (G17, CN)

52-G. **Dust Collector, Maintenance "Musts" for Grinding Magnesium.** Roy Nash. *Western Metals,* v. 10, Dec. 1952, p. 45-47.
Hazards involved and ways of preventing fires and accidents when grinding Mg. (G18, Mg)

53-G. **Production Costs Minimized by Simplified Stamping Operation for Gold, Silver Jewelry Items.** Howard

E. Jackson. *Western Metals,* v. 10, Dec. 1952, p. 54-55.

Describes production of jewelry, souvenir spoons, and pins, rings, etc. at Northern Stamping & Manufacturing Co., Seattle, Wash. Photographs. (G3, Au, Ag)

**54-G. Sheet Magnesium Problem Licked.** *Aviation Week,* v. 58, Jan. 12, 1953, p. 40.

Low-temperature forming is made possible by use of Fiberglas mold and Neoprene blanket at low pressure. (G4, Mg)

**55-G. Savings Claimed for New Carbide Grinding Procedure.** *Machine and Tool Blue Book,* v. 49, Jan. 1953, p. 202-204, 206, 210-214.

Method developed by Precision Diamond Tool Co., Elgin, Ill. Results of tests conducted to determine efficiency. Photographs. (G18, C-n)

**56-G. Huge Mechanical Press Speeds Production of Steel Cartridge Cases.** H. G. Hron. *Machinery* (American), v. 59, Jan. 1953, p. 151-157.

Press which preforms processes of cupping and preheading simultaneously with only three subsequent draws required from SAE 1030 steel. Photographs. (G4, CN)

**57-G. Unusual Die Produces Metal-and-Felt Washers.** *Machinery* (American), v. 59, Jan. 1953, p. 208-210.

Die for producing brass washers. (G1, Cu)

**58-G.** (French.) **Grinding in the Foundry.** Marcel Hubert and Gilbert Gross. *Fonderie,* v. 81, Oct. 1952, p. 3130-3142.

Operation of grinding machines, properties of grinding tips, proper choice of grinders, and applications. (G18)

**59-G.** (German.) **Precision Drilling, Grinding, Lapping, and Honing of Motor Parts in the Repair of Automotive Engines.** A. Linek. *Metalloberfläche,* ser. A, v. 6, Nov. 1952, p. 164-170.

Machinery used and details of repair operations. Photographs. (G17, G18, G19)

**60-G.** (German.) **Shape and Evaluation of Tool Life-Cutting Speed Curves.** Franz Rapatz and Franz Motalik. *Stahl und Eisen,* v. 72, Dec. 4, 1952, p. 1583-1587.

Experimental and published data were used in evaluation. Relations of tool life and machinability were established. Tables and charts. 13 ref. (G17, TS)

**61-G.** (Book-German.) **(Dictionary of the Technique of Grinding and Polishing.) Wörterbuch Der Schleif- und Poliertechnik.** B. Kleinschmidt. 96 pages. 1952. Technischer Verlag Herbert Cram, Berlin W35, Germany. 9.80 DM.

Translations of German-English and English-German grinding and polishing terms, some not yet found in other technical dictionaries. Illustrations with captions in both languages. (G18, G19)

# H

## POWDER METALLURGY

**5-H. Some Properties of Aluminium Flake Powder. 4. The Degree of Flakiness.** G. W. Wendon. *Paint Manufacture,* v. 22, Dec. 1952, p. 455-459, 472.

Pigment behavior, flakiness studies, and classification methods. Graphs and tables. (H11, Al)

**6-H. Floating Die Table Equalizes Press Action.** George Karian. *Iron Age,* v. 170, Dec. 25, 1952, p. 78-80.

Savings over large-size, dual punch press for compacting metal powders. (H14)

**7-H. Excellent Products of Aluminum Powder Metallurgy.** John P. Lyle, Jr. *Metal Progress,* v. 62, Dec. 1952, p. 109-112.

Tensile properties, and results of creep and fatigue tests on Al and Al alloys made by powder metallurgy. Tables and graphs. (H general, Q general, Al)

**8-H. Sintering of Ultrafine Ferromagnetic Powders.** N. I. Ananthanarayanan and J. F. Libsch. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 79-80.

Experiments were restricted to powders prepared by low-temperature reduction of finely divided jeweller's rouge in purified $H_2$. 11 ref. (H10, Fe)

**9-H. How Powder Metallurgy Is Progressing.** H. W. Greenwood. *Metallurgia,* v. 46, Dec. 1952, p. 289-292, 298.

Metal powders of Fe, Cu, stainless steel, and Al; pressing and sintering, bearings, high-temperature alloys and magnetic materials. 3 ref. (H general, Fe, Cu, SS, Al, SG-h, n, p)

# J

## HEAT TREATMENT

**18-J. Pit Type Carburizing Furnaces Provides Flexible Setup.** W. J. Wright. *Automotive Industries,* v. 107, December 15, 1952, p. 46-47, 80, 82, 87-88.

Furnaces installed at Caterpillar Tractor Co. Photographs and diagram. (J28)

**19-J.** (Russian.) **The Softenability of Limited Solid Solutions of Metals.** K. A. Osipov and S. G. Fedotov. *Doklady Akademii Nauk SSSR,* v. 85, Aug. 11, 1952, p. 1081-1084.

Short-time (30 sec.) and long-time (60 min.) hardness tests of Cu-Al, Cu-Zn, and Cu-Sn alloys were made at 20 and 500° C. to study effects of electron concentrations on softenabilities of alloys. Data are charted. 17 ref. (J23, Cu, Al, Zn, Sn)

**20-J. Short Cycle Annealing of Whiteheart Malleable Castings.** P. F. Hancock. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 376-390.

Recent British developments in short-cycle annealing of whiteheart malleable iron castings using controlled atmosphere furnaces. Micrographs and tables. (J23, CI)

**21-J. Continuous Heating, Press Forging and Heat Treating of Automobile Crankshafts. II.** *Industrial Heating,* v. 19, Dec. 1952, p. 2246-2248, 2250, 2252, 2254, 2256, 2258.

Automatic operations of hardening, tempering, and shot-blast cleaning. Photographs and diagrams. (J26, J29, L10, CN)

**22-J. Hints on the Heat Treatment of Tool Steels.** L. H. Seabright. *Iron Age,* v. 171, Jan. 1, 1953, p. 310-311.

General discussion. (J general, TS)

**23-J. Heat Treating Aluminum Alloys. Tempering Oils for Aging 75S.** Gilbert C. Close. *Light Metal Age,* v. 10, Dec. 1952, p. 8-9.

General discussion. (J27, Al)

**24-J. Versatile Fixtures for High Production Gas Carburizing.** T. A. Frischman. *Materials & Methods,* v. 36, Dec. 1952, p. 109-111.

Methods of handling camshafts, gear shafts, bored pieces and other complicated parts of many different sizes by use of trays. (J28, ST)

**25-J. Salt Bath Carburizing.** John K. McIver. *Metal Progress,* v. 62, Dec. 1952, p. 85-87.

Advantages, economic factors, and various uses. Practical operations in diversified plant. (J28, J2)

**26-J. A Cooperative Research Program on Quenching.** Victor Paschkis. *Metal Progress,* v. 62, Dec. 1952, p. 93-96.

Background, purpose, and organization research on rates of temperature change at Columbia University. (J26, CN)

**27-J. Jet Parts Call for Novel Heat-Treatment.** *Metal-Working,* v. 9, Jan. 1953, p. 12-13.

Newly designed furnace employed for stress-relieving operations installed by Ryan Aeronautical Co. (J1)

**28-J. Bed Ways: Hardened Under Fire.** *Steel,* v. 131, Dec. 29, 1952, p. 86.

Design and construction of machine for flame hardening of lathe bed ways. Photographs. (J2, CI)

**29-J. Case-Hardening of Austenitic Stainless Steels by the Carbidizing Process.** Lloyd M. Allen and Dudley Woodard. *Steel Processing,* v. 38, Dec. 1952, p. 615-620.

Formation of Cr carbides and carbidization of Type 303 stainless. Micrographs. (J28, SS)

**30-J. Gas Fired Furnaces Help Save Critical Material.** Fred H. Bremmer and F. J. Zehnder. *Steel Processing,* v. 38, Dec. 1952, p. 621-623.

Process of continuous heat treating quench and draw line to give steel specified characteristics with savings of Mo and Mn. Applications in furnaces. Photographs. (J26, AY)

**31-J. High-Speed Flame-Hardening.** H. C. Phelps. *Welding Engineer,* v. 38, Jan. 1953, p. 42-43.

Process developed by International Plainfield Motor Co., Plainfield, N. J., for hardening camshafts used in Mack truck, fire, bus, and marine engines. (J2, ST)

**32-J. Modern Heat Treating of Axle Components.** R. F. Lutz. *Automotive Industries,* v. 108, Jan. 1, 1953, p. 48-49, 122, 124, 126, 128.

Procedure developed and used at Timken-Detroit Axle Co., Newark, Ohio. Photographs. (J general, CN)

**33-J. Automatic Induction Hardening of Transmission Shifter Forks.** Arthur A. Lyness, Jr. *Automotive Industries,* v. 108, Jan. 1, 1953, p. 90, 96, 98.

Steps for forging high-carbon steel shifter forks, and use of new hardening machine which improved quality of product. (J2, F22, CN)

**34-J. Cost-Cutting Method of Hardening Small Parts.** Claude C. Dierdorf. *Machinery* (American), v. 59, Jan. 1953, p. 158-160.

Different intricately shaped parts are martempered, carbo-nitrided, carburized, straight-hardened, or annealed in a batch-type, controlled-atmosphere furnace having an automatic quench tank. Lower cost steels can be used, and cleaning and straightening operations are reduced. Photographs. (J26, J28, ST)

**35-J. The Application of Ratio Delay Principle to Heat Treating Operations.** Chas. R. Weir. *Metal Treating,* v. 3, Nov.-Dec. 1952, p. 8-9.

Survey made at Commonwealth Industries, Detroit. Data are tabulated. (J general)

**36-J. Heat Treatment of Magnetic Materials.** R. E. Wolf. *Metal Treating,* v. 3, Nov.-Dec. 1952, p. 10.

Necessary equipment and processes. (J general, SG-p, n)

**37-J.** (French.) **Determination of Annealing Conditions for the Relaxation of Stresses in Refractory Steels.** Georges Vidal and André Loupoff. *Métaux Corrosion Industrie,* v. 27, Sept. 1952, p. 371-378.

Investigations show parameters of relaxation annealing depend upon chemical composition of the alloy, upon its previous thermal treatment, and geometric form. Diagrams, graphs, and tables. (J23, Q25, SS)

# K

## JOINING

**61-K. Resistance Welding of Aircraft Structures.** John Starr. *Aero Digest*, v. 65, Dec. 1952, p. 50, 52, 54, 56, 58.

Development of welding in aircraft industry. Compares results with those of riveted construction. (K3)

**62-K. Fumes and Gases in Arc Welding.** Erik Thrysin, Gideon Gerhardsson, and Sven Forssman. *A. M. A. Archives of Industrial Hygiene and Occupational Medicine*, v. 6, Nov. 1952, p. 381-403.

Tests were made on composition of gases and fumes produced by manual arc welding with electrodes intended for joining mild steel, stainless steel, cast iron, bronze, and Monel metal. Test apparatus and procedure for taking samples. Tables and photographs.
(K1, SS, CI, Fe, Cu, Ni)

**63-K. Railway Engineering. Part II. Improved Running Conditions: Use of Welding for Long Lengths of Rail: Development of Prestressed Concrete Techniques.** Rolt Hammond. *Overseas Engineer*, v. 26, Dec. 1952, p. 178-179.

Details of techniques. Photographs and diagrams.
(K general, T23, ST)

**64-K. An Investigation Into the Criteria of Weldability of Low-Carbon Steel Sheets.** H. C. Goosens and C. Vollers. *Sheet Metal Industries*, v. 29, Nov. 1952, p. 1097-1113.

Investigation by the Research Committee of the Netherlands Welding Society to ascertain what method was most suitable for the determination of the weldability of steel sheets. Diagrams, micrographs, tables, photographs, and graphs.
(K9, CN)

**65-K. Ingenious Repair by Welding.** *Transactions of the Institute of Welding*, v. 15, Oct. 1952, p. 131-132.

Repair job on cast iron wheel.
(K general, CI)

**66-K. Industrial Brazing: Induction Brazing.** E. V. Beatson and H. R. Brooker. *Welding and Metal Fabrication*, v. 20, Nov. 1952, p. 406-410; Dec. 1952, p. 439-442.

Various methods and materials used in the process. Photographs and diagrams. (K8)

**67-K. The A. C. Welding Arc.** L. H. Orton, J. C. Needham. *Welding and Metal Fabrication*, v. 20, Dec. 1952, p. 451-452, 453-454.

Effects of alternating current arc re-ignition characteristics and influence of short-time characteristics of welding circuit on arc maintenance. (K1)

**68-K. Inert-Gas Shielding of the Metallic Arc.** William L. Green and Robert J. Krieger. *Welding Journal*, v. 31, Dec. 1952, p. 582s-586s.

Investigation conducted to study burn-off rates and spatter losses accompanying the shielding of the arc of 5/32 x 14-in. carbon steel electrode (polished core wire) with inert gases. Two types of metal transfer in the inert-gas-shielded consumable-electrode arc were observed on high-speed motion pictures. Graphs. (K1, CN)

**69-K. Failures and Defects Encountered in the Construction of Welded Ships.** R. D. Bradway. *Welding Journal*, v. 31, Dec. 1952, p. 1111-1121.

Different types of cracks are classified as to origin and cause with special emphasis on welding procedures, fabrication, workmanship, design and materials. Diagrams. (K9)

**70-K. Fusion Welding Techniques for Jet Aircraft Components.** Arnold S. Rose and Morton A. Braun. *Welding Journal*, V. 31, Dec., 1952, p. 1121-1128.

Welding processes under discussion include inert-gas shielded-arc, shielded-inert-gas metal-arc, and submerged arc as applied to stainless steels, high-temperature alloys, low-carbon steels and low-carbon, low-alloy steels. Tables and micrographs. (K1, SS, AY, CN)

**71-K. How to Save Cost by Designing for Structural Welding.** Alfred E. Pearson. *Welding Journal*, v. 31, Dec. 1952, p. 1129-1135.

Factors affecting cost of a number of welded connections frequently used for welded structures. Diagrams. (K general, T26)

**72-K. Surface Alloying in Brazing and Related Techniques.** Dr. Robert Humphrey and Rene D. Wasserman. *Welding Journal*, v. 31, Dec. 1952, p. 1135-1140.

A general discussion. Graphs and photographs. (K8)

**73-K. Magnetic Force Welding.** Myron Zuker and Guy Cubitt-Smith. *Welding Journal*, v. 31, Dec. 1952, p. 1141-1153.

Machine which uses the magnetic force of the welding current to produce rapidly rising pressure on the work. Pressure is adjustable in magnitude and synchronized with the welding current. Results of tests on Cu, Ag, W, Al, and steel. Photographs and charts.
(K3, Cu, Ag, W, Al, CN)

**74-K. Experiments on Brittle Fracture of Steel Resulting From Residual Welding Stresses.** R. Weck. *Welding Research*, v. 6, Aug. 1952, p. 70r-82r.

Results of tests on ¾-in. carbon and low-alloy steel plates welded so as to produce high residual stresses. Photographs, micrographs, and charts. (K9, CN, AY)

**75-K. Argon-Arc Welding of Copper.** J. H. Cole. *Welding Research*, v.6, Aug., 1952, p. 83r-86r.

Reviews developments and observations at the British Welding Research Association laboratories. Data are tabulated. (K1, Cu)

**76-K. C.T.S. Weldability Test for High-Tensile Structural Steels, Welded by the Metal-Arc Process.** *Welding Research*, v. 6, Oct. 1952, p. 89r-92r.

Test developed by the British Welding Research Association, consisting of a series of fillet welds. Diagrams and tables. (K9, K1, ST)

**77-K. Surface Cleaning of Some Aluminium Alloys Prior to Spot Welding.** H. E. Dixon. *Welding Research*, v. 6, Oct. 1952, p. 93r-101r.

Results of research carried out by the British Welding Research Association. Data are tabulated and charted. (K3, L12, Al)

**78-K. Target Fixtures Precision-Weld New Gun Pedestal.** E. C. Pearson and Frank George. *American Machinist*, v. 97, Jan. 5, 1953, p. 114-117.

Precision-machined pieces are welded to unmachined pedestals at Watertown Arsenal. Target fixtures locate pieces precisely during welding so machined surfaces are in accurate relationship to surfaces machined in later operations. Process cuts layout time, reduces rework, and minimizes over-all production cycle. Photographs. (K1, G17)

**79-K. Welding Tool Steels With the Auswelding Method.** Tore Noren. *American Society for Metals*, "Proceedings of the First World Metallurgical Congress", 1952, p. 412-419.

Repairing or refacing of toolsteels by heating base metal to proper austenitizing temperature then cooling to and welding at temperature where austenite decomposes most slowly. (K general, TS)

**80-K. Welding Austenitic Steels for High-Pressure Boiler Plants.** Egon Kauhausen. *American Society for Metals*, "Proceedings of the First World Metallurgical Congress", 1952, p. 429-435.

Difficulties involved. A successful method of welding using the Argon-arc method was evolved after careful tests for microfissures, corrosion, embrittlement, etc.
(K1, AY, SS)

**81-K. Hot Galvanized Steel Water Tanks Welded by Submerged Arc Technique.** A. M. McIntyre. *Canadian Metals*, v. 15, Dec. 1952, p. 46, 48.

General discussion. (K1, CN)

**82-K. Construction of a Tubular Steel Skip Bridge.** *Engineer*, v. 194, Dec. 19, 1952, p. 831-832.

Welding manipulation problems encountered. (K1, T26, CN)

**83-K. Welding of Malleable Castings.** T. J. Palmer. *Foundry Trade Journal*, v. 93, Dec. 11, 1952, p. 667-672.

Process differences, metallurgical considerations, porosity, practical methods of joining, and bronze welding. Micrographs.
(K general, CI)

**84-K. General Function of Coatings on Arc Welding Electrodes.** David Rozet. *Industry & Welding*, v. 26, Jan. 1953, p. 33-34, 36, 62-63.

Composition, protection of weld metal, arc stability, cooling rate, and uniform metal flow. Tabulated information on chemical analyses of mild steel electrodes, basic coatings, and mechanical properties.
(K1, CN)

**85-K. Glass Tape Backup Improves Quality of Root Welds.** L. R. Constantine. *Industry & Welding*, v. 26, Jan. 1953, p. 41-42, 58, 60-62.

Advantages over gases or iron powder backup, particularly for stainless steel welding.
(K general, SS)

**86-K. Combination Machine Forms and Welds in Automatic Operation.** *Industry & Welding*, v. 26, Jan. 1953, p. 44-46.

Machine has automatic welding cycle, cuts production costs, and eliminates overforming. Photographs. (K1, G general)

**87-K. Twin-Arc Welding.** *Machinery* (Lloyd), v. 24, Dec. 1952, p. 105-106.

Advantages over single-phase welding. (K1)

**88-K. Welding Stainless Steels.** *Machinery* (Lloyd), v. 24, Dec. 1952, p. 120-121.

Problems and techniques.
(K general, SS)

**89-K. Aluminum Honeycomb Sandwich Has Light Weight, High Strength, Good Stability, Uniform Density.** Phillip O'Keefe. *Materials & Methods*, v. 36, Dec. 1952, p. 96-98.

Properties and fabrication of Al honeycomb. (K12, Al)

**90-K. Brazing Vacuum-Tight Joints in High Nickel Alloys.** Robert A. Wallace and William R. Vanderveer. *Materials & Methods*, v. 36, Dec. 1952, p. 117-118.

How Sylvania made several consecutive brazes on relatively large parts to produce a clean, oxide-free, vacuum-tight assembly. (K8, Ni)

**91-K. Technical Factors in Cold Welding Aluminum.** W. E. McCullough. *Modern Metals*, v. 8, Dec. 1952, p. 40, 42, 44.

The 3-phase cycle of cold welding, method of testing the weld bond, and recent developments in Al-Al, Cu-Cu and Al-Cu joining. (K5, Al, Cu)

**92-K. Welding Meets Jet-Engine Challenge.** K. H. Koopman. *Steel,* v. 131, Dec. 29, 1952, p. 76-80.
Tungsten-arc, sigma, and submerged-arc welding. Lists base metal and logical choice of welding rod for joining dissimilar metal combinations. Photographs. (K1)

**93-K. Lungs of Steel.** *Steel Horizons,* v. 14, Year-End 1952, p.16-17.
Assembly and use of stainless steel nozzle boxes in aircraft. Six types of welding are used. (K general, T24, SS)

**94-K. Big Joints Welded for Gas Turbines.** *Welding Engineer,* v. 38, Jan. 1953, p. 23.
Automatic inert-gas welding of expansion joints of Type 321 stainless steel to standard carbon or low-alloy steel ends. (K1, SS, CN, AY)

**95-K. New Technique for Brazing and Soldering of Aluminum.** Thomas A. Dickinson. *Welding Engineer,* v. 38, Jan. 1953, p. 32-33.
Technique which is adaptable to brazing and soldering with variation in filler material, fluxes, and fusion temperatures. (K7, K8, Al)

**96-K. Titanium to Tile, Aluminum to Titanium.** Arthur L. Phillips. *Welding Engineer,* v. 38, Jan. 1953, p. 36-37.
Bonding agent which successfully joins materials of dissimilar properties. (K11, Ti, Al)

**97-K. Billions in Sales, Millions in Savings.** Julius Heuschkel. *Welding Engineer,* v. 38, Jan. 1953, p. 38-41.
Welding procedures in electrical industry. Processes, design and materials, education required, and future prospects. (K general)

**98-K. How to Set Up a Program for Quality Control.** Peter G. Poetto. *Welding Engineer,* v. 38, Jan. 1953, p. 44-46, 48.
Program set up at C B C Welding Corp. to reduce inefficiency of resistance welding Al and steel products. Cleaning procedure, control of solutions, machine maintenance, and check list. (K3, S12, Al, ST)

**99-K.** (German.) **Wedge Welding of Aluminum and Copper by Means of Selfwelding.** Wilhelm Hofmann, Hans-Jochen Husmann, and Rolf Koppe, *Zeitschrift für Metallkunde,* v. 43, Oct. 1952, p. 354-356.
Process in which Cu wedges are driven into Al at temperatures above 548° C. Tensile strength and electric conductivity of weld joints were determined. Advantages and possibilities of application. Diagrams, photographs. (K6, Q27, P15, Al, Cu)

**100-K. The Training of Electric Welding Supervisors.** R. B. Luttrell. *Australasian Engineer,* Nov. 7, 1952, p. 42-45.
Advantages of training, requirements for a welding supervisor, advantages of employing a supervisor, and meaning of the supervisory certificate. (K1, A6)

**101-K. Nickel-Clad Steels Welded by Shielded Metal-Arc Process.** Richard G. Lyall. *Iron Age,* v. 171, Jan. 15, 1953, p. 102-103.
Welding carbon steel or low-alloy high-strength steel clad with Ni. (K1, L22, CN, AY)

**102-K. Factors Which Dictate the Design of Ferrous Welding Electrodes.** D. L. Mathias. *Foote Prints,* v. 24, No. 2, 1952, p. 7-24.
Functions of electrode coating, phases of electrode formulation, chemical formulation, arc shielding, arc stability, arc energy, and factors affecting them; deoxidation and alloying; physical formulation; processing procedure; and coating materials. Graphs and photographs. (K1, T5, ST)

**103-K. Joining Stampings.** Federico Strasser. *Machine Design,* v. 25, Jan. 1953, p. 163-165.
Riveting and locking methods of designing economical joints for multiple piece stamping assemblies. Diagrams. (K13)

**104-K. Welding Practice With Stainless Steel. Part II. Oxyacetylene; Inert-Gas Metal-Arc; Spot Welding.** E. M. Rains. *Sheet Metal Worker,* v. 44, Jan. 1953, p. 86-87.
Brief description. Photographs. (K1, K2, SS)

**105-K. Welded Plate Girders.** F. Brooksbank. *Welding and Metal Fabrication,* v. 20, Oct. 1952, p. 363-366; Nov. 1952, p. 400-403; Dec. 1952, p. 448-450; v. 21, Jan. 1953, p. 30-34.
Design considerations of welded plate girders. Part II: Assembly procedure, distortion and contraction in welding, use of automatic welding, continuous plate girders, and design for a 30-ft. plate girder for use in building construction. Part III: Flanges. Part IV: Mathematical analysis. Diagrams and tables. (K1, T26, CN)

**106-K. Metal Fabrication in the Owen Organization.** *Welding and Metal Fabrication,* v. 21, Jan. 1953, p. 2-8.
Equipment and products with emphasis on welded steel components. Photographs. (K general, ST)

**107-K. All-Welded Plate Girder Through-Type Bridge.** *Welding and Metal Fabrication,* v. 21, Jan. 1953, p. 9-12.
Welding techniques, and fabrication of a British steel bridge. Photographs. (K1, T26, CN)

**108-K. Fixtures and Positioners for Manual Arc Welding.** Donald Ross. *Welding and Metal Fabrication,* v. 21, Jan. 1953, p. 17-20, 24.
Fixtures for cutting, preparation, setting up, tacking, putting down the weld, deslagging, fettling, and general cleaning of the weldment. (K1, CN)

**109-K.** (German.) **Pressure Welding of Metals.** Hummitzsch. *Schweisstechnik,* v. 6, Oct. 1952, p. 116-118.
Lap-joints can be made with Al, Sn, Cu, and steel if surfaces are clean. Speed of deformation has no effect at room temperature. 3 ref. (K2, Al, Sn, Cu, ST)

**110-K.** (Book.) **Lead Work for Modern Plumbing.** 164 pages. 1953. Lead Industries Association, 420 Lexington Ave., New York 17, N. Y. $1.50.
Lead working tools, how to do soldering with "irons," joint wiping, lead pipe bending, and yarning and calking cast-iron pipe joints, all given in step-by-step photographic sequence as well as explanatory text. (K7, Pb, CI)

**111-K.** (Book.) **Recommended Practice for the Welding of Steel Castings.** 38 pages. Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. 35 cents.
Manual to serve as a guide in establishing practices which lead to sound, crack-free welds, welding of steel castings (cast-weld construction), and fabricating structures through welding of steel castings to wrought steel products (composite fabrication). (K general, CI)



# L

## CLEANING, COATING AND FINISHING

**61-L. Triangular Logarithmic Net for the Calculation of Plating Thicknesses.** D. R. Curry. *Electroplating and Metal Spraying,* Dec. 1952, p. 397-399.
Principle and details. (L17)

**62-L. The Filtration and Pumping of Plating Solutions. Pt. 3.** G. T. Colegate. *Electroplating and Metal Spraying,* v. 5, Dec. 1952, p. 401-407.
Use of anode bags, diaphragm tanks, filter press, and filter cloths. (L17)

**63-L. Radiometric Evaluation of the Effectiveness of the Chromic Acid Rinse Treatment for Phosphated Work.** Stanley L. Eisler and Jodie Doss. *Metal Finishing,* v. 50, Dec. 1952, p. 54-58, 69.
Results of radiometric and supplementary salt spray tests on which several solutions of varying concentrations of $CrO_3$ and $CrO_3$-$H_3PO_4$ were used for coating 1020 steel. Tables. (L14, R11, CN)

**64-L. Properties of Electrodeposited Nickel.** *Metal Finishing,* v. 50, Dec. 1952, p. 59-62.
Laboratory investigation in which cathode current efficiencies and the internal stress of deposits were determined for different bath compositions and operating conditions. Results showed that hardness, tensile strength, and other properties of Ni deposits can be varied over a wide range by proper choice of bath. Graphs and micrographs. (L17, Ni)

**65-L. Radioactivity Helps Study of Silver Brighteners.** S. E. Eaton, R. W. Fabian, and E. H. Newton. *Metal Finishing,* v. 50, Dec. 1952, p. 63-64.
Experimental work on the behavior of ammonium thiosulfate brightener in silver cyanide plating baths using radioactive sulfur as a means of detecting and measuring the thiosulfate sulfur. (L17, S19, Ag)

**66-L. Lead-Clad Copper Solves an Anodizing Problem.** *Metal Finishing,* v. 50, Dec. 1952, p. 65-66, 72.
Results of test on cooling capacity of Pb-clad Cu coil. (L19, Pb, Cu)

**67-L. A Non-Electrolytic Smoothing Treatment for Steel.** W. A. Marshall. *Metal Finishing,* v. 50, Nov. 1952, p. 78-83, 85; Dec. 1952, p. 67-69.
Part I: Method used for smoothing and etching steel samples for metallographic examination. It has potential use for etching steel articles without destroying polish prior to decorative plating. Tables, diagrams, and micrographs. Part II: adhesion of electrodeposited Ni to treated ferrous metals. (L12, L17, M21, Ni, CN, CI)

**68-L. Methods for Comparative Evaluation of Paint Bonding. Metal Phosphate Pre-Treatments on Steel.** Max Kronstein, Louis F. DeLong, and Alfred W. Norman. *Paint and Varnish Production,* v. 42, Dec. 1952, p. 18-27, 66.
Methods for comparing paint-bonding characteristics of phosphate pretreatments for four representative types in their stripping weight profile, and actual paint-bonding effect under long-time salt-fog exposure and electrographic printing tests. Graphs and photographs. (L14, ST)

**69-L. Phosphate Coating Progress 1945-52.2.** A. R. King. *Paint Manufacture,* v. 22, Dec. 1952, p. 463-465, 472. (Concluded.)

The Rotodip method, and some cold phosphating methods for steel protection. Special features of the phosphating processes that were used in Germany during the war and which have stimulated other users to investigate this valuable aid to production efficiency. Possible future developments in this field. Tables. (L14, ST)

**70-L. The Thermal Oxidation of Tin.** R. K. Hart. *Proceedings of the Physical Society,* sec. B, v. 65, Dec. 1, 1952, p. 955.

Electron diffraction experiments show that when Sn foil is thermally oxidized in air an amorphous oxide layer is formed at temperatures up to 130° C. Above 130° C. only crystalline SnO and $SnO_2$ are formed. (L14, R2, Sn)

**71-L. Zinc Economy Trials in an Industrial Hot-Dip Galvanizing Plant.** D. N. Fagg and N. B. Rutherford. *Sheet Metal Industries,* v. 29, Nov. 1952, p. 1117-1125.

Economies which resulted in production of thinner and more uniform coatings and reduction in formation of residuals. Photographs, tables, and graphs. (L16, Zn, CN)

**72-L. Pyrophyllite in Refractory Enamels.** George J. Bishop, III. *American Ceramic Society Bulletin,* v. 31, Dec. 1952, p. 493-496.

Investigation to determine value of pyrophyllite in developing a coating which offers protection from oxidation of low-carbon steel at operating temperatures higher than organic coating can withstand. Tables. (L27, CN)

**73-L. Anti-Corrosive Treatments for Magnesium.** Tukasa Kawamura. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 645-650.

Two improvements on the Bengough treatment of Mg by immersion in selenious acid solution. (L16, Mg)

**74-L. Remarks on Spray Drying.** C. Bergsoe. *Engineers' Digest,* v. 13, Dec. 1952, p. 428-430. (Translated and condensed from *De Ingenieur,* v. 64, July 18, 1952, p. 71-76)

Spray drying from point of view of design and use of spray-drying plant. 4 ref. (L26)

**75-L. Advantages of Infra-Red Drying With Gas.** Fred M. Reiter. *Industrial Gas,* v. 31, Dec. 1952, p. 8-10, 24-25.

Tests made on Al and steel articles. Physical penetration, low-temperature operations, and speed. Tables. (L26, Al, ST)

**76-L. Changes in the Processes and Products of the Tin Plate Industry. III.** (concluded.) Charles A. Ferguson. *Industrial Heating,* v. 19, Dec. 1952, p. 2301-2302, 2304, 2306, 2316.

Changes in final cleaning after tinning. Predicts some of the changes that will occur in the future. (L17, CN, Sn)

**77-L. Some Recent Applications of the Metal Spraying Process.** *Machinery* (London), v. 81, Dec. 12, 1952, p. 1207-1216.

General discussion including such topics as Mo coating for bonding, metallizing machine tool shafts, reclamation of machined components, and filling of grooves and cracks. Micrographs and photographs. (L23, Mo)

**78-L. Automatic Plating Plant for Motor Car Hub Caps.** *Machinery* (London), v. 81, Dec. 19, 1952, p. 1281-1282.

Process includes polishing, degreasing, and plating. Photographs. (L17, CN)

**79-L. Aluminum Coatings Applied to Steel by Many Methods.** E. M. Smith. *Materials & Methods,* v. 36, Dec. 1952, p. 105-108.

Factors on which choice of coating depends, namely: size and shape

of object, appearance desired, and service conditions. Various methods of coating. (L general, Al, ST)

**80-L. Polishing Compositions. Factors Affecting the Economic Selection of Finishing Compounds.** Frank Spicer. *Metal Industry,* v. 81, Dec. 19, 1952, p. 485-486.

General discussion. (L10)

**81-L. Utilization of Spent Copper Electrolytes.** C. C. Downie. *Mining Magazine,* v. 87, Dec. 1952, p. 334-336.

Enrichment of electrolytes and use for $CuSO_4$ production.
(L17, C23, Cu)

**82-L. Notes on the Electrodeposition of Thick Gold Deposits.** Charles L. Bauer. *Plating,* v. 39, Dec. 1952, p. 1335-1336, 1338.

Investigation to find suitable bath for electrodeposition of Au. Au concentration, cyanide concentration, cyanide decomposition, carbonate control, and addition agents.
(L17, Au)

**83-L. Effect of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions. 6. The Effects and Removal of Iron.** D. T. Ewing, A. A. Brouwer, and J K. Werner. *Plating,* v. 39, Dec. 1952, p. 1343-1349.

Effects of Fe as an impurity in four types of Ni plating solutions were investigated. Data which indicate accompanying changes in certain physical properties of electrolytic Ni. Graphs and tables.
(L17, Ni, Fe)

**84-L. Tool Finishing Costs Reduced by Wet Blasting.** Eugene F. Anderson. *Tool Engineer,* v. 30, Jan. 1953, p. 53-54.

Advantages, matte finish produced, and glare reduction. Photographs. (L10)

**85-L. Metal Coatings.** R. A. Schaus. *Western Machinery and Steel World,* v. 43, Nov. 1952, p. 99-101, 116; Dec. 1952, p. 104-106.

Application of metal coatings to steel by hot dipping, electrolysis, cementation, welding and cladding.
(L general, ST)

**86-L. Infra-Red Finish Baking Tunnels Speed Production of Civilian, Military Items.** Fred Burt. *Western Metals,* v. 10, Dec. 1952, p. 58-60.

Finishing layout and processes at Thermador Electrical Manufacturing Co. of Los Angeles. (L26)

**87-L. Reo Adopts Hot Spray Painting.** *Automotive Industries,* v. 108, Jan. 1, 1953, p. 72-73, 110.

Steps carried out at Reo Motors, Inc. for hot spray painting of sheet metal. (L26)

**88-L. Slidabrading. A Faster, Cheaper Way to Precision-Finish Small Parts.** Richard De Pastina. *Factory Management and Maintenance,* v. 111, Jan. 1953, p. 106-108.

Defines slidabrading, why used, how to use, costs, and what products can be slidabraded. Photographs. (L10)

**89-L. Industry Gets Chemically Clean Steel Drums.** *Iron Age,* v. 171, Jan. 15, 1953, p. 100-101.

Rust-inhibiting treatment previously used in automotive and appliance industries is now applied to steel drums. In nine prefinishing stages, drums are cleaned, rinsed and phosphatized to give better paint adherence and under-finish rust resistance. Residues and contaminants are completely removed. Photographs. (L14, ST)

**90-L. The Effect of Temperature on the Cathode Potential During Nickel Plating.** Dennis R. Turner. *Journal of the Electrochemical Society,* v. 100, Jan. 1953, p. 15-21.

Effect of temperature on cathode potential during Ni plating was studied at current densities ranging from 0.4-100 milliamp. per sq. cm. at temperatures from 20-90° C. Mathematical interpretation. Graphs. 18 ref. (L17, Ni)

**91-L. Review of Recent Developments in Electroplating.** H. Silman. *Metallurgia,* v. 46, Dec. 1952, p. 283-288, 298.

Substitutes for Ni plate, periodic reverse current plating, plating of Al, anodizing, plating of Mg, electroplating and filtration plants, plastics in plating, electropolishing and chemical polishing, effluent disposal, and cleaners. 28 ref.
(L17, L13, Al, Mg, Ni)

**92-L. Colorless Lacquers.** J. Towner. *Plating,* v. 40, Jan. 1953, p. 48, 58.

Applications of lacquers to ferrous and nonferrous metals to promote adhesion, provide filling, and present aesthetic appeal and weather protection. (L26)

**93-L. Artistic Finishes on Lamps.** Frank L. Bonem. *Products Finishing,* v. 17, Jan. 1953, p. 20-27.

Cu, brass, and Ag plating, brush finishing, lacquering, enameling, and staining are utilized to achieve striking finish that is trademark of the Rembrandt Lamp Corp. Photographs. (L general, Cu, Ag)

**94-L. Vacuum Metallization of Plastics.** George Bancroft. *Products Finishing,* v. 17, Jan. 1953, p. 30-32, 34.

Vacuum vapor plating of metals and plastics with metal coatings, Al being most popular for plating. Use of lacquer. (L23, Al)

**95-L. Flame Plating.** *Screw Machine Engineering,* v. 14, Jan. 1953, p. 37-39.

Method developed for plating with powders, such as tungsten carbide. Photograph. (L22, W, C-n)

**96-L. Porcelain Coatings: Ingenuity Is the Progress Factor.** W. A. Barrows. *Steel,* v. 132, Jan. 12, 1953, p. 72-74.

Advantages of using porcelain coatings. Warns against coating nonferrous metals and gives precautions for welding. (L27, K general, EG-a)

**97-L. Oil Mist Tames Tinning Problems.** *Steel,* v. 132, Jan. 12, 1953, p. 80, 82.

Use of oil mist lubrication which prevents loss of time and lowers cost by not contaminating tinning baths with grease. (L16, Sn)

**98-L. A Study of the Behaviour of Polarized Electrodes. Part 3. The Behaviour of the Silver/Silver Chloride System During Electrolytic Reduction.** G. W. D. Briggs and H. R. Thirsk. *Transactions of the Faraday Society,* v. 48, Dec. 1952, p. 1171-1178.

Electrochemical methods supplemented by microscopy were used to study rdeuction of anodically formed films of CaCl on Ag. Efficiency of anodic and cathodic processes was investigated. Diagrams, graphs, tables, and micrographs. 8 ref. (L17, Ag)

**99-L.** (French.) **The Diffusion of Ions Through Metallic Coatings.** Maurice Bonnemay, Helmy Makram, and Jean Royon. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 235, Oct. 17, 1952, p. 955-957.

Principle of testing porosity of electrolytic Cu deposits by utilizing radioactive tracers. (L17, S19, Cu)

**100-L.** (German.) **Thin Sheet Galvanizing and Processing Into Corrugated Sheet Iron and Shapes.** H. Rückemesser. *Metall,* v. 6, Nov. 6, 1952, p. 695-699.

Shop diagrams and description. Details of the manufacturing process. Photographs. (L16, CN, Zn)

**101-L.** (German.) **Factors of Current Utilization in Electropolishing Baths.** A. Wogrinz. *Metalloberfläche,* ser. B, v. 4, Nov. 1952, p. 161-162.

Significance and various calculations concerning factor of current distribution. Details of Wolfram's experiments. (L13)

**102-L.** (German.) **The Improvement of the Properties, Especially of the Scattering Capacity, of Nickel Baths by Means of Sulfurous Acid and Its Salts.** H. Komusaari. *Metalloberfläche,* ser. 3, v. 4, Nov. 1952, p. 162-163.

Experiments for depositing Ni in areas of low current density and yet preserve luster. Details of composition of the bath. (L17, Ni)

**103-L.** (German.) **Fundamental Problems of Lacquering of Sheet Iron and Metal Castings.** Fritz Reichel. *Metalloberfläche,* ser. B, v. 4, Nov. 1952, p. 164-166.

Various processes for achieving optimum surface effects. (L26, CN)

**104-L.** (German.) **Pickling as a Preparation for Surface Finish.** (Concluded) R. Petri. *Metalloberfläche,* ser. A, v. 6, Nov. 1952, p. 170-174.

Changes in material during pickling, and role of these changes for formation of electrolytic coatings. Micrographs. (L12)

**105-L.** (German.) **Electric Welding of Hard Facings to Rails.** Franz Novotny. *Schweisstechnik,* v. 6, Oct. 1952, p. 109-114.

Because of varying behavior of rails from different heats it was found desirable to hard face both inner and outer rails. (L24, CN)

**106-L.** (Book-Dutch.) **(Contribution to the Theory of the Chromium Plating Process.) Bijdrage Tot De Kennis Van Het Verchromen.** Johan Wessel Holleman. 56 pages. 1952. Uitgeverij H. J., Paleisstraat 76, Antwerp, Belgium.

Mechanisms of processes that occur in Cr plating baths. Effects of various additives and catalysts. 47 ref. (L17, Cr)

**107-L.** (Book.) **Magnesium Finishing.** 140 pages. 1952. Dow Chemical Co., Midland, Mich.

Finishing systems, surface stability and treatment, mechanical finishing, chemical treatments, painting, and assembly protection.
(L general, Mg)

**108-L.** (Book.) **Metal Finishing Guide book Directory.** 556 pages. 1953. Finishing Publications, 381 Broadway, Westwood, N. J. $3.00.

Basic material is same as in previous editions. Latest developments in techniques and equipment are included. (L general)

# M
## METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

**29-M. Grain Size. Key to Mechanical Properties.** H. A. Unckel. *Iron Age,* v. 170, Dec. 18, 1952, p. 148-152.

Mechanical properties of metals and alloys show a marked rise or fall with changes in grain size. Tensile strength, yield point, hardness, and reduction of area show varying degrees of change and differences in Al, Cu, and brass due to combined effects of orientation and porosity concentration along crystal boundaries. Tables, micrographs, and photographs. 10 ref.
(M27, Q general, Al, Cu)

**30-M. The Total Neutron Cross-Sections of Cobalt, Silver, Iodine, Aluminium, Nickel, and Gallium Between 1 eV and 5 keV.** A. W. Merrison and E. R. Wiblin. *Proceedings of the Royal Society,* ser. A, v. 215, Nov. 25, 1952, p. 278-289.

Experimental results of total neutron cross-section measurements made with a neutron time of flight spectrometer at the Atomic Energy Research Establishment, Harwell.

Ag, Co, I, Al, Ni, and Ga were studied. Results are presented as curves showing the variation of total cross-section with neutron energy. Graphs. (M25, Co, Ag, Al, Ni, Ga)

**31-M. Crystal Structure and Antiferromagnetism in Haematite.** B. T. M. Willis and H. P. Rooksby. *Proceedings of the Physical Society,* sec. B, v. 65, Dec. 1, 1952, p. 950-954.

Investigated by X-ray analysis in the range 20-950° C. Results are interpreted in terms of an antiferromagnetic behavior of pure hematite, with a Curie point at approximately 675° C. The behavior is analogous to that of cubic oxides FeO and $Fe_3O_4$, which exhibit structure cell deformations on cooling through certain critical temperatures. Graphs. 11 ref. (M26, P16, Fe)

**32-M. Two Powder Metallurgical Methods to Prepare Alloy Specimens on a Laboratory Scale.** Jacob Schram. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 682-694.

Two methods of preparing alloys from powders; by mixing and by impregnating a sintered compact. Fe-Zn alloys were used in the experiments.
(M21, H general, Fe, Zn)

**33-M. Phase Changes Associated With Sigma Formation in 18-8-3-1 Chromium-Nickel-Molybdenum-Titanium Steel.** K. W. J. Bowen and T. P. Hoar. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 695-706.

A study was made using metallographic, magnetic, and density measurements. Tables, charts, and micrographs. 13 ref. (M24, SS)

**34-M. Electrolytic Polishing of Zirconium, Titanium, and Beryllium.** P. A. Jacquet. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 732-751.

Techniques, solutions, advantages and disadvantages. Micrographs. 20 ref. (M21, Zr, Ti, Be)

**35-M. Neutron Diffraction Studies of Cold-Worked Brass.** R. J. Weiss, J. R. Clark, L. Corliss, and J. Hastings. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1379-1382.

Background, integrated intensities, extinction effects, and nature of line broadening. 15 ref. (M22, Cu)

**36-M. Mechanism of Growth of Whiskers on Cadmium.** Milton O. Peach. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1401-1403.

Qualitative explanation for cause and mechanism of growth of whiskers observed on Cd and Sn. Diagrams. (M26, Cd, Sn)

**37-M. Equilibrium Relations at 460° C. in Aluminium-Rich Alloys Containing 0-7% Copper, 0-7% Magnesium, and 1.2% Silicon.** H. J. Axon. *Journal of the Institute of Metals,* v. 20, Dec. 1952, p. 209-213.

Phases encountered are Al-rich solid solution, $CuAl_2$, $Mg_2Si$, Si, ternary phase $Al_2CuMg$, and a quaternary phase which probably has composition $Al_5Cu_2Mg_8Si_6$. These phases give rise to 14 separate phase fields. A new 460° C. isothermal for Al rich region of Al-Cu-Si system is also given. 16 ref.
(M24, Al, Cu, Mg, Si)

**38-M. The Sub-Grain Structure in Aluminium Deformed at Elevated Temperatures.** J. A. Ramsey. *Journal of the Institute of Metals,* v. 20, Dec. 1952, p. 215-216.

Structures in coarse-grained Al deformed at high temperatures were found to resemble structures resulting from room temperature deformation followed by heating.
(M27, Q24, Al)

**39-M. Microscopical Examination of Samples of Iron Containing Aluminous Inclusions.** R. E. Lismer and F. B. Pickering. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 381-383.

To establish optical and chemical properties of inclusions, specimens were examined under normal vertical illumination, under polarized light, after application of Whiteley's test, and after acid tests. Table and micrographs. (M27, Fe)

**40-M. Autoradiography of Metal Surfaces Using a Radiochemical Method.** E. Rabinowicz. *Nature,* v. 170, Dec. 13, 1952, p. 1029-1030.
(M23, Cu)

**41-M.** (German.) **Structure of the Copper-Silver-Indium System. II. Process of Equilibrium up to an Indium Content of 30%.** Erich Gebhardt and Manfrid Dreher. *Zeitschrift für Metallkunde,* v. 43, Oct. 1952, p. 357-363.

Results of thermal, microscopic and radiographic investigations, as well as electric conductivity. Equilibrium diagrams with In contents of 10, 20, 25, and 30% are plotted. Tables, diagrams, micrographs.
(M24, Cu, Ag, In)

**42-M. A Replica Method for Study of the Structure of Lead-Antimony Alloys.** Jeanne Burbank. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 55-56.

Technique developed for microscopic study of 3-dimensional structure of Pb-Sb alloys by formation of a chemical replica in which internal structure of metal may be seen directly. Micrographs.
(M21, Pb, Sb)

**43-M. Effect of Alloying Elements on the Behavior of Nitrogen in Alpha Iron.** L. J. Dijkstra and R. J. Sladek. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 69-72.

Theory and recent work on effects of Mn, Cr, Mo, and V on internal friction and elastic recovery. Changes in atomic structure. Graphs. 9 ref.
(M25, Q21, Q22, Fe, Cr, Mo, V)

**44-M. Systems Zirconium-Molybdenum and Zirconium-Wolfram.** R. F. Domagala, D. J. McPherson, and M. Hansen. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 73-79.

On basis of metallographic analysis, incipient melting data, thermal analysis work, and X-ray diffraction, phase relationships in 0-50 atomic % alloy content were carefully resolved. Phase relationships in higher alloy content regions were outlined and a single intermediate phase, peritectically formed, of form $ZrX_2$ was established in each system. Tables, graphs, and micrographs. 6 ref. (M24, Zr, Mo, W)

**45-M. Measurement of Internal Boundaries in Three-Dimensional Structures by Random Sectioning.** Cyril Stanley Smith and Lester Guttman. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 81-87.

It is shown, from a study of geometric probabilities, that average number of intercepts per unit length of a random line drawn through a 3-dimensional structure is exactly half true ratio of surface to volume. Metric relations are tabulated that may be of use in studies of microstructure of polycrystalline, cellular, or particulate matter generally. Diagrams and tables. 11 ref.
(M27)

**46-M. Uniformly Moving Dislocations in Anisotropic Media.** A. W. Saenz. *Journal of Rational Mechanics and Analysis,* v. 2, Jan. 1953, p. 83-98.

Mathematical interpretation. 25 ref. (M26)

**47-M. Correlation Between Electron and Optical Microscopical Examination of Metal Surfaces.** E. C. W. Perryman and Sheila Vernon-Smith. *Journal of the Royal Microscopical Society,* v. 72, Nov. 1952, p. 99-101.

Examples are given of correlation between images of metallurgical preparations as observed in light microscope, with and without phase contrast, and in the electron microscope. These illustrate difficulties of unambiguous interpretation and show need for a more critical, preferably comparative, approach in metallurgical microscopy. Cu was used in the experiments. Micrographs. (M21, Cu)

**48-M. Some Observations on the Structure of Spheroidal Graphite in Nodular Cast Irons.** M. N. Parthasarathi, B. S. Srikantiah, and B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 11A, Nov. 1952, p. 501-504.

Brief discussion. Micrographs. 7 ref. (M27, CI)

**49-M. The Effect of Structure on Machining Characteristics of Steel.** V. H. Erickson. *Metal Treating,* v. 3, Nov.-Dec. 1952, p. 6-7, 23.

General discussion. (M27, G17, ST)

**50-M. Growth Spirals Originating From Screw Dislocations on Electrolytically Produced Titanium Crystals.** M. A. Steinberg. *Nature,* v. 170, Dec. 27, 1952, p. 1119-1120.

Briefly describes investigation. Micrographs. 6 ref. (M26, Ti)

**51-M. Crystal Distortion of Graphite in Cast Irons.** Eitaro Matuyama. *Nature,* v. 170, Dec. 27, 1952, p. 1123-1124.

Briefly describes investigation. Graphs. (M26, CI)

**52-M. Surface Impregnation of Steel With Tungsten From a Gaseous Medium.** G. N. Dubinin. Henry Brutcher Translation 2941, 9 pages.

Previously abstracted from original in *Doklady Akademii Nauk SSSR.* See item 407-M, 1952.
(M24, N1, W, ST)

**53-M.** (German.) **Investigations Into the Ternary Systems Mg-Cu-Zn, Mg-Ni-Zn, and Mg-Cu-Ni.** Karl Heinz Lieser and Helmut Witte. *Zeitschrift für Metallkunde,* v. 43, Nov. 1952, p. 396-401.

Thermal, X-ray, and microscopic investigations were carried out to explain existence of the quasi-binary systems. Tables, graphs, and micrographs. 17 ref.
(M24, Mg, Cu, Zn, Ni)

**54-M.** (Book-German.) **(Ternary Aluminum Alloys) Ternäre Legierungen des Aluminiums.** Heinrich Hanemann and Angelica Schrader. 170 pages plus 502 photomicrographs. 1952. Verlag Stahleisen G.m.b.H. Düsseldorf, Germany.

Metallographic phenomena and metallographic techniques. Includes phase diagrams and tabulated data. 223 ref. (M21, M24, M27, Al)

**55-M.** (Book.) **X-Ray Crystallographic Technology.** Andre Guinier. (Translated from the French by T. L. Tippell) 330 pages. 1952. Hilger and Watts Ltd., 98 St. Pancras Way, Camden Rd., London, N.W.1, England. 56s. Obtainable in U. S. from Jarrell-Ash Co., 165 Newberry St., Boston 16, Mass. $9.50.

The general properties of X-rays, elements of crystallography and of diffraction theory. The different problems amenable to X-ray crystallography, and some more difficult questions, such as the influence of crystalline imperfections, diffraction by amorphous bodies, and small particle scattering. (M22, M26)

# N

## TRANSFORMATIONS AND RESULTING STRUCTURES

**14-N. Oriented Chemical Growth on Single Crystals of Zinc and Cadmium.** L. N. Lucas. *Proceedings of the Royal Society,* ser. A, v. 215, Nov. 25, 1952, p. 162-174.

Contact planes between substrate and oriented overgrowth were found by determining the facets upon which a particular orientation occurs. Clean surfaces of the metallic crystals used were prepared by electrolytic methods. Inner potentials of Zn and ZnO were measured. Micrographs and diagrams. 10 ref. (N12, Zn, Cd)

**15-N. Solid Solutions. Classification of the Solubilities of Elements in Iron.** I. I. Kornilov. *Iron & Steel,* v. 25, Dec. 1952, p. 517-521. (Translated from *Izvestiia Akademii Nauk SSSR,* Section of Chemical Sciences).

Previously abstracted from the original. See item 35-N, 1950. (N8, Fe)

**16-N. Recent Developments in the Metallurgy of Aluminum Piston Alloys With Hypereutectic Silicon Content.** Emma Maria Onitsch-Modl. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 325-337.

Tendency of hypereutectic Al-Si piston alloys toward coarse primary solidification and simultaneous segregation was studied. A hypothesis is proposed which may represent a solution of the problem of metallic and nonmetallic additions to light alloys. Tables, charts, and micrographs. 15 ref. (N12, Al)

**17-N. Crystal Orientation in Cold-Rolled Silicon-Iron Sheet.** I. Gokyu and H. Abe. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 580-590.

Cold-rolling, recrystallization, and coarsening textures of silicon steel were studied by X-ray, magnetic, and etch-pit methods. Photographs and diagrams. (N5, Q24, AY)

**18-N. Magnetic Measurements of Age-Hardening of Iron-Molybdenum Alloys.** Tokushichi Mishima, Ryukiti R. Hisiguti, and Yasuo Kimura. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 656-667.

Age hardening was studied by measuring hardness, lattice constants, and saturation magnetization. Activation energies for aging were calculated. 17 ref. (N7, Fe, Mo)

**19-N. Study on Age-Hardening.** Yoshitsugu Mishima. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 668-681.

Data on age hardening fall into two groups; those with an Austin-Rickett exponent of 1 and those with an exponent of 2 or more. Differences are explained. Tables and charts. 24 ref. (N7)

**20-N. An Interpretation of the Hysteresis Loops in $A_3$ and $A_4$ Transformations of Pure Iron.** Kotaro Honda and Mizuho Sato. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 707-716.

Calculations and theoretical considerations of the effects of internal stresses on $A_3$ and $A_4$ transformations. (N6, Fe)

**21-N. The Allotropy of Cobalt.** A. G. Metcalfe. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress," 1952, p. 717-731.

A transformation at 1119-1145° C was found by dilatometric measurements and confirmed by thermal etching. Allotropic forms are compared and explained. 27 ref. (N6, Co)

**22-N. The Influence of Manganese in Solid Solution on the Recrystallization Temperature and Grain Size of Pure Aluminum Sheet.** G. Marchand. *Canadian Journal of Technology,* v. 31, Jan. 1953, p. 15-28.

Experimental procedure for determination. 16 ref. (N5, Mn, Al)

**23-N. Grain-Refinement and Its Effects in Non-Ferrous Casting Alloys.** A. Cibula. *Foundry Trade Journal,* v. 93, Dec. 18, 1952, p. 695-703.

Influence of grain size on casting and mechanical properties of nonferrous casting alloys. Identities and properties of solidification nuclei in some fine-grained alloys. Recent developments in refinement of Al and Cu-base alloys. Graphs and micrographs. 45 ref. (N12, Q general, E25, Al, Cu)

**24-N. Solubility and Diffusion Coefficient of Carbon in Nickel. Reaction Rates of Nickel-Carbon Alloys With Barium Oxide.** J. J. Lander, H. E. Kern, and A. L. Beach. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1305-1309.

Experimental study. Tables and graphs. (N1, P13, Ni)

**25-N. The Diffusion of Antimony in Silver Single Crystals.** L. Slifkin, D. Lazarus, and T. Tomizuka. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1405.

Briefly reviews previous work. Graphs. (N1, Sb, Ag)

**26-N. Polygonization During Diffusion.** R. W. Balluffi. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1407-1408.

Experimental procedure using Cu-Ni and Au-Ag couples. Micrographs. (N1, Cu, Ni, Au, Ag)

**27-N. Effect of Impurities on the Self-Diffusion of Silver.** R. E. Hoffman and D. Turnbull. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1409-1410.

Experimental techniques. Graphs. (N1, Ag)

**28-N. A Study of Order-Disorder and Precipitation Phenomena in Nickel-Chromium Alloys.** *Journal of the Institute of Metals,* v. 20, Dec. 1952, p. 169-180.

Electrical resistivity, specific heat, and X-ray measurements were made on $Ni_3Cr$ and $Ni_{15}Cr_4Al$. Both alloys undergo order-disorder transformations at approximately the same temperature. An additional high-temperature transformation occurs in ternary alloys, consistent with precipitation and re-solution of a second phase. Graphs. 26 ref. (N10, N7, Ni, Cr)

**29-N. The Effect of Certain Solute Elements on the Recrystallization of Copper.** V. A. Phillips and Arthur Phillips. *Journal of the Institute of Metals,* v. 20, Dec. 1952, p. 185-208.

Activation energies were calculated from hardness results on pure Cu and binary alloys containing small amounts of P, Ag, Cd, As, Te, and Cr. Approximate measurements were made of growth and nucleation rates. Tables, graphs, and micrographs. 23 ref. (N5, N2, N3, Cu)

**30-N. Grain Refinement of Titanium.** H. P. Leighly and H. L. Walker. *Metal Progress,* v. 62, Dec. 1952, p. 116, 118.

Brief discussion. Micrographs. (N3, Ti)

**31-N. The Effect of Mechanical Deformation on the Growth of Cadmium Iodide Crystals From Solution.** A. Korndorffer, H. Rahbek, and F. S. A. Sultan. *Philosophical Magazine,* v. 43, Dec. 1952, p. 1301-1306.

$CdI_2$ crystals were used to study general growth phenomena. Slip processes may account for spiral nature of crystal growth. (N12)

**32-N.** (French.) **Contribution to the Study of Austenite Stabilization.** J. Plateau, J. Duflot, and C. Crussard. *Revue de Metallurgie,* v. 49, Nov. 1952, p. 815-833; disc., p. 834.

A study was made using two high-carbon steels. Stabilization apparently is caused by internal stresses. Micrographs, tables, and diagrams. 15 ref. (N8, CN)

**33-N. Some Recent Ideas on Recovery and Recrystallization.** J. A. Ramsay. *Australasian Engineer,* Nov. 7, 1952, p. 58-62.

Main features of recovery and recrystallization with particular emphasis paid to structural changes occurring prior to recrystallization. Relationship of the latter to the formation of recrystallization nuclei. Diagrams and micrographs. 27 ref. (N4, N5)

**34-N. Microsegregation in the Lead-Antimony Alloys.** A. C. Simon and E. L. Jones. *Journal of the Electrochemical Society,* v. 100, Jan. 1953, p. 1-10.

Freezing process occurring in Pb and hypo-eutectic Pb-Sb alloys was studied in single crystals and polycrystalline aggregates by examination of metallographic structure with microscopic, microradiographic, and chemical replica techniques. Causes and extent of microsegregation. Graphs and micrographs. 11 ref. (N12, Pb, Sb)

**35-N. On the Stabilization of Austenite With Respect to the Martensite Transformation.** G. N. Bogacheva and V. D. Sadovskii. Henry Brutcher Translation 2905, 8 pages.

Previously abstracted from original in *Doklady Akademii Nauk SSSR.* See item 204-N, 1952. (N8, AY, SS, Fe)

**36-N. Surface Impregnation of Steel With Molybdenum From a Gaseous Medium.** G. N. Dubinin. Henry Brutcher Translation 2942, 8 pages.

Previously abstracted from original in *Doklady Akademii Nauk SSSR.* See item 278-N, 1952. (N1, M24, Fe, Mo)

**37-N.** (German.) **Aluminum and Gas.** Hans Kostron. *Zeitschrift für Metallkunde,* v. 43, Nov. 1952, p. 373-387.

Reactions of $H_2$ with Al and its alloys. Micrographs and graphs. 101 ref. (N1, Al)

**38-N.** (Portuguese.) **The Phenomenon of Diffusion.** Luiz C. Correa da Silva. *ABM Boletim da Associacao Brasileira de Metais,* v. 8, July 1952, p. 234-250.

Occurrence during heat treatment and during solidification of alloys; various mechanisms which explain movement of atoms in crystal lattices; laws governing diffusion; and experimental observations clarifying the problem. Graphs and diagrams. 13 ref. (N1, N12, J general)

# P

## PHYSICAL PROPERTIES AND TEST METHODS

**35-P. New Swedish Heating Material for Ceramic Kilns.** John Grindrod. *Ceramics,* v. 4, Nov. 1952, p. 423-424.

Brief description of Mo alloy claimed to withstand temperatures up to 1600 or 1700° C. (P11, Mo)

**36-P. The Participation of f Orbitals in Bonding in Uranium and the Transuranium Elements.** Robert E. Connick and Z. Z. Hugus, Jr. *Journal*

*of the American Chemical Society,* v. 74, Dec. 12, 1952, p. 6012-6015.
20 references. (P10, U)

**37-P. A Thermodynamic Study of Liquid Metallic Solutions. V. The Systems Zinc-Bismuth and Zinc-Lead.** O. J. Kleppa. *Journal of the American Chemical Society,* v. 74, Dec. 12, 1952, p. 6052-6056.
Experimental data and results. Phase diagrams. 13 ref.
(P12, M24, Zn, Bi, Pb)

**38-P. A Thermodynamic Study of Liquid Metallic Solutions. IV. Approximate Thermodynamic Data From the Phase Diagram for the Systems Copper-Bismuth, Copper-Lead and Copper-Thallium.** O. J. Kleppa. *Journal of the American Chemical Society,* v. 74, Dec. 12, 1952, p. 6047-6051.
New method which, for certain types of phase diagrams, makes it possible to separate the calculated partial molal free energies (along the liquidus) into approximate heat and entropy terms. Method has been applied to the systems Cu-Pb, Cu-Bi and Cu-Th. Phase diagrams. 15 ref. (P12, M24, Cu, Bi, Pb, Th)

**39-P. Complicated Domain Patterns on Iron-Silicon Single Crystals.** C. F. Ying, S. L. Levy, and R. Truell. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1339-1345.
Domain patterns on surfaces of Fe-Si single crystals were observed between successive electrolytic or mechanical polishings. Micrographs.
(P16, Fe, Si)

**40-P. High-Frequency Calibration of Magnetic Materials.** *Journal of the Franklin Institute,* v. 254, Dec. 1952, p. 534-536.
Calibration service by National Bureau of Standards for determining r-f permeability and loss factor of magnetic materials in frequency range between 50 kc. and 30 Mc.
(P16, SG-n, p)

**41-P. Iron-Carbon-Sulphur Melts.** D. A. Spratt and J. A. Kitchener. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 383-386.
Relationship between C and S in iron melts. Micrographs. 20 ref.
(P12, Fe)

**42-P. Irreversible Phenomena in Metallurgy.** R. A. Oriani. *Journal of Physical Chemistry,* v. 56, Dec. 26, 1952, p. 1025-1030.
Applications of thermodynamics to identifying proper forces and fluxes and in elucidating cross-effects when more than one force is operating. Diagrams. 35 ref. (P12)

**43-P. Chemical Behavior of Sulphur in Iron and Steelmaking.** John Chipman. *Metal Progress,* v. 62, Dec. 1952, p. 97-107.
Studies on openhearth slags, blast furnace slag data, reaction of S with $H_2$, computation of activity coefficient, chemistry of desulphurizing action, and transfer rate of S. Graphs and diagrams. 20 ref.
(P12, D general, CI, ST)

**44-P. Magnetic Properties of Stainless Steel Wire. Effect of Cold Work.** W. Sucksmith. *Metal Treatment and Drop Forging,* v. 19, Dec. 1952, p. 545-546, 549.
Magnetic properties which are factors in efficient recording of sound on wire. Effect of cold working and heat treatment.
(P16, J general, SS)

**45-P. Hall Effect in Zinc Crystals at Low Temperatures.** John K. Logan and Jules A. Marcus. *Physical Review,* ser. 2, v. 88, Dec. 15, 1952, p. 1234-1238.
Experimental study. For each crystal, one component of Hall field was measured for fixed crystallographic orientation of current density, and for various orientations of magnetic field in plane perpendicular to current density. Graphs and diagrams. 14 ref. (P15, Zn)

**46-P. Energy Levels in Magnesium, Vanadium, Chromium, and Manganese.** H. J. Hausman, A. J. Allen, J. S. Arthur, R. S. Bender, and C. J. McDole. *Physical Review,* ser. 2, v. 88, Dec. 15, 1952, p. 1296-1299.
Targets of Mg, V, Cr, and Mn were bombarded by 8-Mev protons from 47-in. cyclotron and reaction particle observed at an angle of 150° to incident beam. Graphs.
(P15, Mg, V, Cr, Mn)

**47-P. Experimental Verification of the Relationship Between Diffusion Constant and Mobility of Electrons and Holes.** *Physical Review,* ser. 2, v. 88, Dec. 15, 1952, p. 1368-1369.
Relationship between diffusion constant and mobility was experimentally verified for electrons and holes in Ge by measuring rate of increase in half concentration width of a pulse of minority carriers moving in an electric field. (P15, N1, Ge)

**48-P. Optical and Infrared Reflectivity of Metals at Low Temperatures.** T. Holstein. *Physical Review,* ser. 2, v. 88, Dec. 15, 1952, p. 1427-1428.
Brief mathematical analyses.
(P17)

**49-P.** (English.) **Relationship Between the Transverse Magnetogalvanic Effects and Resistivity.** A. L. Perrier. *Helvetica Physica Acta,* v. 25, No. 6, 1952, p. 615-618.
Formulas and various aspects of the isothermic Hall effect from the physics viewpoint. (P15)

**50-P.** (Russian.) **Influence of Size on the Critical Field of the Second Group.** A. A. Abrikosov. *Doklady Akademii Nauk SSSR,* v. 86, Sept. 21, 1952, p. 489-492.
Experiments were made on the influence of layer thickness for Tl and Sn. Data are charted. (P15, Tl, Sn)

**51-P.** (Russian.) **Investigation of Superconducting Properties of Thallium and Tin Films Condensed at Low Temperatures.** N. V. Zavaritskii. *Doklady Akademii Nauk SSSR,* v. 86, Sept. 21, 1952, p. 501-504.
An experimental study. Deposits were made at 80 and 2° K. Data are tabulated and charted.
(P15, Tl, Sn)

**52-P. Some Properties of Tin—II Sulfate Solutions and Their Role in Electrodeposition of Tin. I. Solutions With Only Tin—II Sulfate Present.** C. A. Discher. *Journal of the Electrochemical Society,* v. 100, Jan. 1953, p. 45-51.
Density, refractive index, surface tension, viscosity, freezing point depression, conductivity, transference number, electrode potential to pure Sn and $H_2$, respectively, were measured for various aqueous tin-II sulfate solutions. Relationship between concentration and magnitude of these properties, and various derived properties, are discussed. Inferences are drawn with respect to structure of species in solution. Graphs. 5 ref.
(P general, L17, Sn)

**53-P. Density and Hydrogen Occlusion of Some Ferrous Metals.** J. H. Keeler and H. M. Davis. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 44-48.
Low-metalloid rimmed ingot iron, a rimmed steel of SAE 1020 grade, and a high-purity iron were heat treated in purified $H_2$ in an airtight furnace. Results. Graphs and tables. 26 ref. (P10, N1, Fe, CN)

**54-P. On the Magnetic Shunt Characteristics of Fe-Ni-Cr Alloys and M. S. Alloy.** Hakaru Masumoto, Yuki Shirakawa, and Toru Ohara. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 237-245.
Investigation was made of Fe-Ni-Cr alloys in order to improve magnetic shunt properties with a view of obtaining alloys having less Ni than Monel type Ni-Cu alloys and more reproductivity than Fe-Ni alloys. Tables and graphs. 6 ref.
(P16, Fe, Ni, Cr, Cu)

**55-P. On the Thermal Expansion, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Cobalt, Iron and Vanadium and a New Alloy "Velinvar".** Hakaru Masumoto, Hideo Saito, and Takeo Kobayashi. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 255-260.
Results of investigation. Tables and graphs. (P11, Q23, Co, Fe, V)

**56-P. A Mechanism of Spin-Lattice Relaxation in Ferromagnetic Substances.** Tokutaro Hirone and Noboru Tsuya. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 261-267.
Mathematical analysis. 11 ref.
(P16, SG-n, p)

**57-P. Electrical Properties of Antimony-Doped Tellurium Crystals.** Tadao Fukuroi, Seiichi Tanuma, and Shotaro Tobisawa. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 283-297.
Electrical resistivity, Hall effect, and thermo-electric power of Te crystals alloyed with Sb were measured from liquid air temperature to 300° C., and data are compared with properties of pure Te crystals with a view to clarifying change of electrical properties accompanying increase of acceptor impurities. Tables, graphs, and diagrams. 7 ref.
(P15, Te, Sb)

**58-P. Solubility of Nitrogen in Iron-Chromium Alloys.** K. T. Kurochkin, P. V. Gel'd, and V. I. Iavoiskii. Henry Brutcher Translation 2936. 8 pages.
Previously abstracted from original in *Doklady Akademii Nauk SSSR.* See item 457-P, 1952.
(P13, Fe)

**59-P.** (French.) **Secondary Electronic Emission of Some Metals Under the Impact of Positive Lithium Ions.** Georges Couchet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 235, Oct. 17, 1952, p. 944-946.
Experimental arrangement. Results obtained with duralumin, stainless steel, and Mumetal.
(P15, Al, SS, Ni)

**60-P.** (German.) **On the Question of Electron Emission of Cold Worked Metals.** Werner Pepperhoff. *Zeitschrift für Metallkunde,* v. 43, Nov. 1952, p. 402-403.
Electron emission occurring as an after-effect of mechanical treatment on metallic surfaces causes a blackening of photographic layers. Photographs. 5 ref. (P15)

**61-P.** (Book.) **An Advanced Treatise on Physical Chemistry. Vol. 3. The Properties of Solids.** J. R. Partington. 639 pages. 1952. Longmans, Green and Co., 43 Albert Dr., London, S.W.19, England.
General properties of solids, crystals, crystal lattices and space groups, isomorphism, density, elastic properties, tensile strength, hardness, surface energy, viscosity, thermal expansion, specific heats, theory of solid state, thermal conductivity, and fusion. Mathematical appendix on vectors and tensors, complex variable, and calculus of variations.
(P general, M26, Q general)

**62-P.** (Book-German.) **(Magnetic Materials.) Magnetische Werkstoffe.** Franz Pawlek. 303 pages. 1952. Springer-Verlag, Berlin, Germany.
Data on properties and applications of permanent magnets; soft magnetic materials; materials with special magnetic and mechanical properties; and nonmagnetic materials. (P16, SG-n, p)

**63-P.** (Book.) **Structure of Metals. Ed. 2.** Charles S. Barrett. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $10.00.

Deals with atomic arrangement in metals, solid and liquid. Extensive revisions of sections concerning dislocations, imperfections, creep, structures of solid and liquid metals and alloys, textures and transformations.
(M general, N general, P general)

# Q

## MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

**47-Q. Cast Iron That Bends.** *Diesel Power and Diesel Transportation,* v. 30, Dec. 1952, p. 60-61, 87.

Development and composition of ductile iron. Characteristics of castability, tensile properties, wear resistance, fatigue resistance, and resistance to shock loads.
(Q general, CI)

**48-Q. Micro Indentation-Hardness, A New Definition.** P. Grodzinski. *Industrial Diamond Review,* new ser., v. 12, Oct. 1952, p. 209-218; Nov. 1952, p. 235-238.

See abstract of German version in *Schweizer Archiv für angewandte Wissenschaft und Technik,* item 1065-Q, 1952. (Q29)

**49-Q. Plastic Instability Under Plane Stress.** H. W. Swift. *Journal of the Mechanics and Physics of Solids.* v. 1, Oct. 1952, p. 1-18.

Examines conditions for instability of plastic strain under plane stress for materials conforming to the Mises-Hencky yield condition and strain hardening according to a unique relationship between root-mean-square values of shear stress ($q$) and incremental strain ($\delta\psi$) and certain cases of nonuniform stress distribution. Data are tabulated and charted. (Q23)

**50-Q. On Discontinuous Plastic States, With Special Reference to Localized Necking in Thin Sheets.** R. Hill. *Journal of the Mechanics and Physics of Solids,* v. 1, Oct. 1952, p. 19-30.

Theoretical discussion of localized necking of a sheet deformed in its plane. Results are illustrated by modes of necking in tensile specimens. 13 ref. (Q27)

**51-Q. Rheology of Metals at Elevated Temperatures.** A. E. Johnson and N. E. Frost. *Journal of the Mechanics and Physics of Solids,* v. 1, Oct. 1952, p. 37-52.

General stress, time, and temperature dependence of creep, plastic strain, and relaxation properties of several metals and alloys involving simple tensile, torsion, and combined stress-creep tests, and similar varieties of short period plastic strain tests and relaxation tests. Tables and charts. 14 ref. (Q24, Q3)

**52-Q. The Time Laws of Creep.** A. H. Cottrell. *Journal of the Mechanics and Physics of Solids,* v. 1, Oct. 1952, p. 53-63.

Attempts are made to explain and correlate various theories and experimental observations on creep of metals. 21 ref. (Q3)

**53-Q. The Yield Phenomenon In Polycrystalline Mild Steel.** W. M. Lomer. *Journal of the Mechanics and Physics of Solids,* v. 1, Oct. 1952, p. 64-73.

Attempts to summarize and interrelate the important macroscopic features of yield in polycrystalline iron. 24 ref. (Q23)

**54-Q. The Structural Behaviour of the Main Engine Seatings and Bedplate in a Cargo Ship Under Static Bending Tests.** A. J. Johnson and J. E. Richards. *North East Coast Institution of Engineers & Shipbuilders, Transactions,* v. 69, Pt. 2, Dec. 1952, p. 45-90.

Investigation of flexure of bedplate and seatings of the triple-expansion steam engine of a standard type 10,000-ton dry-cargo ship while subject to static bending tests. Details of the instrumentation and testing technique used. Diagrams, graphs, photographs, and tables. (Q5, CN)

**55-Q. Accommodation Kinking Associated With the Twinning of Zinc.** A. J. W. Moore. *Proceedings of the Physical Society,* sec. B, v. 65, Dec. 1, 1952, p. 956-958.

Small changes of slope on cleavage surfaces of Zn single crystals were measured by a stylus-type profile recorder (Talysurf) and compared with photomicrographs of same areas. Diagrams. (Q24, Zn)

**56-Q. Initiation and Propagation of Brittle Fracture in Structural Steels.** Peter P. Puzak, Earl W. Eschbacher, and William S. Pellini. *Welding Journal,* v. 31, Dec. 1952, p. 561s-581s.

Tests correlated with ship fracture data indicate that structural steels of the ship-plate type develop brittle fracture in the range of service temperatures when loaded in the presence of a sharp cleavage crank defect. Graphs, diagrams, and photographs. (Q26, ST)

**57-Q. Effect of Stresses on Strength of Circumferentially Welded Cylinders.** L. J. Privoznik. *Welding Journal,* v. 31, Dec. 1952, p. 587s-595s.

Investigation showed that under high internal pressures, in steel cylinders in which the parent metal was of equivalent strength to the weld metal, the circumferential band of weld metal in as-weld cylinders increased the bursting strength to a greater degree than did weld metal in stress-relieved cylinders. Graphs and photographs.
(Q23, Q25, J1, ST)

**58-Q. Factors Which Determine the Performance of Aluminum Alloy Weldments.** W. R. Apblett, Jr., C. R. Felmley, and W. S. Pellini. *Welding Journal,* v. 31, Dec. 1952, p. 596s-606s.

The explosion bulge test was utilized to establish the factors which determine the performance of Al alloy weldments. Two types of alloys were investigated; the common heat treatable alloys (61S and 24S) and the solid solution hardening type containing Mg as the primary alloying element. Deformation characteristics of the various weld and base metal combinations were determined by means of photogrids applied to the surface of the specimens. Tables and graphs.
(Q23, Q25, Al)

**59-Q. Column Strength Under Combined Bending and Thrust, Progress Report No. 6 on Welded Continuous Frames and Their Components.** Robert L. Ketter, Lynn S. Beedle, and B. G. Johnston. *Welding Journal,* v. 31, Dec. 1952, p. 607s-622s.

Results of an analytical and experimental study to determine the strength of columns subjected to various combinations of axial load and end bending moment and to determine the behavior of such columns in the elastic and inelastic ranges. Collapse solution based on the "simple plastic" theory is also included together with an approximate buckling solution based on the work by Jezek. Graphs. 21 ref.
(Q5, Q28)

**60-Q.** (Russian.) **Corrugations on the Surface of Certain Machine Parts.** Ia. L. Nudel'man and L. B. Erlikh. *Doklady Akademii Nauk SSSR,* v. 85, Aug. 11, 1952, p. 971-974.

Causes were determined experimentally and were analyzed using the elastic theory. (Q9, Q25, ST)

**61-Q. The Mechanical Properties of Iron and Some Iron Alloys of High Purity.** W. P. Rees. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 506-534.

Influence of C and Mn on transition temperature of Fe was studied by means of impact tests. Data are tabulated and charted. (Q6, Fe)

**62-Q. Effect of Hydrogen on the Deformation and Fracture of Iron and Steel in Simple Tension.** Paul Bastien and Pierre Azou. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 535-552.

A detailed study. Segregation of $H_2$ at dislocations and imperfections appeared to be cause of brittleness. Tables and diagrams. 16 ref.
(Q27, Q23, CN)

**63-Q. Elimination of Yield Point Phenomena by Temper Rolling and Roller Levelling.** N. H. Polakowski. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 553-571.

Reviews laboratory and commercial methods of eliminating the yield point. Causes are explained. 17 ref.
(Q23, F23, CN)

**64-Q. Mechanical Properties of Spring Steel.** T. Mitsuhasi, M. Ueno, R. Nakagawa, and K. Tsuya. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 572-579.

Tensile properties, endurance limit, and damping capacity of spring steel as martempered, austempered, oil quenched and tempered. Spring properties of spheroidized steel are reported in terms of particle size. Satisfactory properties can be obtained only with particles less than a critical size. (Q general, SG-b, CN)

**65-Q. The Plastic Deformation of Zinc Bicrystals.** Tomoyoshi Kawada. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 591-602.

Stress-strain curves and cross-sectional shapes of zinc bicrystals after deformations are rationalized in simple terms. Tables, charts, photographs, and diagrams. (Q24, Zn)

**66-Q. The Influence of Different Surface Coatings on the Fatigue Strength of Steel.** Otto Forsman and Evert Lundin. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 606-612.

Tests were made on several steels with Zn, Sn, Cd, Ni, and Cr coatings in air, tap water, and 3% salt solution. (Q7, R4, ST)

**67-Q. Some Factors Affecting the Wear of Bronze.** S. G. Daniel and R. Graham. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 613-631.

Factors influencing wear rate were studied on gears and special test bars. Data are tabulated and charted. (Q9, Cu)

**68-Q. A Comparison Between Fe-Cr-Al and Ni-Cr Alloys for High Temperature Service.** Gösta Hildebrand. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 632-636.

Mechanical and physical properties are compared so as to establish fields of application for each.
(Q general, P general, SG-h)

**69-Q. Rheotropic Embrittlement.** E. J. Ripling. *ASTM Bulletin,* Dec. 1952, p. 37-42; disc., p. 42.

Mathematical analysis which considers rheotropic behavior of steel

and Zn. Effect of testing temperature, prestraining method, and effect at constant straining temperature. Graphs. (Q24, ST, Zn)

**70-Q. A Statistical Analysis of the Mechanical Properties of Cast and Wrought Gold Dental Alloys.** S. H. Bush. *ASTM Bulletin,* Oct. 1952, p. 46-50.

Linear correlations for proportional limit and tensile strength, proportional limit and Brinell hardness number, and tensile strength and Brinell hardness number are given in graphical form.
(Q27, Q29, S12, Au)

**71-Q. Solving Problems in Materials.** T. S. Fuller. *ASTM Bulletin,* Oct. 1952, p. 51-62.

Progress in materials which has contributed to advancement in the electrical industry during past 50 years. Cu, Cu with Ag and Cd, supply of Cu, permanent magnets, ferritic steels, ultrasonic testing, and oil-ash corrosion. Failure and stress of materials. Micrographs and graphs.
(Q general, T1, Cu, SG-n, ST)

**72-Q. Fatigue of Metals. Orowan's Theory and Its Practical Implications.** *Automobile Engineer,* v. 42, Dec. 1952, p. 529-531.

Theoretical discussion. Graphs. (Q7)

**73-Q. High Temperature Alloys for Gas Turbines.** (Concluded) H. V. Kinsey. *Canadian Metals,* v. 15, Dec. 1952, p. 20, 22, 24.

Discussion and tabulated data on tensile strength, creep, and rupture properties at elevated temperatures.
(Q27, Q3, Q4, SS, SG-h)

**74-Q. Optical Dynamic Weigh-Bar for a Fatigue-Testing Machine.** P. G. Forrest. *Engineering,* v. 174, Dec. 19, 1952, p. 801.

Apparatus for measuring stress. (Q7)

**75-Q. Casting Design for Heavily Loaded Parts.** E. T. Vincent. *Foundry,* v. 81, Jan. 1953, p. 94-97, 267-273.

Stresses which must be considered when designing castings. Diagrams and photographs. (Q25, E general)

**76-Q. Creep Test Results Guide the Selection of Alloys for Turbines and Jet Engines.** *Industrial Heating,* v. 19, Dec. 1952, p. 2260, 2262, 2390.

Brief description of Westinghouse laboratory. (Q3, T25)

**77-Q. Aluminum Powder Products Compared.** E. Gregory and N. J. Grant. *Iron Age,* v. 170, Dec. 25, 1952, p. 69-73.

Products from M-255, M-257, and SAP Al powder were tested in creep-rupture at temperatures from 400 to 900° F. for times up to 1000 hr. Gains in rupture life and creep resistance are achieved by Al powder products. Tables, graphs, and micrographs. (Q3, H general, Al)

**78-Q. Cold Work Studies on Copper at Low Temperatures.** R. R. Eggleston. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1400-1401.

Results of preliminary experiments on annealing of Cu cold worked at liquid He temperature, which suggests that two annealing states exist in temperature range of 140 to 20° C. Results of analysis of curves for activation energies by assuming a simple rate process for the annealing mechanism. Graphs.
(Q24, J23, Cu)

**79-Q. Amplitude Pulsations in the Vibrational Strain Pattern of Metal Single Crystals.** J. W. Marx. *Journal of Applied Physics,* v. 23, Dec. 1952, p. 1406-1407.

Briefly describes experiments using Zn. (Q21, Zn)

**80-Q. Deformation of Magnesium at Various Rates and Temperatures.** J. W. Suiter and W. A. Wood. *Journal of the Institute of Metals,* v. 20, Dec. 1952, p. 181-184.

X-ray and metallographic studies showed that polycrystalline Mg deforms similarly to Al and Zn in that a subgrain or cell structure is formed within grains. It appears necessary to postulate formation of crystallite "debris" at grain boundaries in order to correlate X-ray and metallographic observations. Micrographs. 11 ref.
(Q24, M26, Mg)

**81-Q. Effect of Residual Stresses on Yielding and Strain-Aging of Carbon Steel.** N. H. Polakowski. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 369-376.

Effect of large-scale residual stresses left in carbon steel after plastic deformation at room temperature on its mechanical properties after aging. Graphs. 18 ref.
(Q general, CN)

**82-Q. Intergranular Brittleness in Iron-Oxygen Alloys.** W. P. Rees and B. E. Hopkins. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 403-409.

Tensile and impact properties of high-purity iron and iron-oxygen alloys, at various temperatures covering tough to brittle transition. Graphs and micrographs. (Q23, Fe)

**83-Q. The Properties of Some Binary Aluminium Alloys at Elevated Temperatures.** J. V. Lyons and W. I. Pumphrey. *Metallurgia,* v. 46, Nov. 1952, p. 219-226; Dec. 1952, p. 299-304.

High-temperature tensile properties of binary alloys of Al with Cu, Fe, Mn, and Zn were determined. An examination was also made of effect of degree of approach to structural equilibrium on high-temperature properties of certain alloys. Implications of the results. Micrographs and graphs. 7 ref.
(Q general, Al)

**84-Q. The Cottrell-Bilby Theory of Yielding of Iron.** Takeo Yokobori. *Physical Review,* ser. 2, v. 88, Dec. 15, 1952, p. 1423.

Brief theoretical analyses. Graphs. (Q23, Fe)

**85-Q.** (French.) **Local Deformations in Simple Tension and Their Role in the Formation of the Neck.** P. Bastien, A. Popoff, and P. Azou. *Revue de Metallurgie,* v. 49, Nov. 1952, p. 783-790; disc., p. 790.

The neck in Fe and Al was found to develop at the point of least strength due to microscopic defects caused by initial plastic deformation. Charts and photographs.
(Q27, Fe, Al)

**86-Q.** (German.) **Effect of Volume and Surface on the Strength Properties of Materials.** G. Meyersberg. *Acta Polytechnica, Physics and Applied Mathematics Series,* v. 2, No. 2, 1952, 123 pages.

Analyzes and describes "volume effect" of test specimens using W. Weibull's theory. Second part discusses "boundary effect" which is opposite to volume effect and is especially significant for cast iron. The third part gives details of experiments on cast iron in bending, torsion, and shear. Tables, diagrams, and photographs. 70 ref.
(Q1, Q2, Q5, CI)

**87-Q.** (German.) **Operating Stresses on Gear Wheels and the Determination of the Stress Resistance Characteristic of the Material.** A. Thum and K. Richard. *Schweizeizer Archiv für Angewandte Wissenschaft und Technik,* v. 18, Oct. 1952, p. 309-321.

Reviews the literature on the correlative effects of material (steel), shape, heat treatment, and type of stress on the life of gear wheels. Modern testing methods are critically evaluated. Diagrams, tables, and graphs. 46 ref. (Q25, ST)

**88-Q.** (German.) **Creep of Aluminum Wire Coil Springs.** Gerhard Lucas and Georg Masing. *Zeitschrift für Metallkunde,* v. 43, Oct. 1952, p. 341-349.

Experimental details. Results affirm the parabolic law for hard drawn specimens. Proposes new logarithmic flow for soft annealed and for hard drawn specimens at liquid-air temperature. Activation energy of plastic deformation was investigated. Tables, charts, 10 ref.
(Q3, Q24, Al)

**89-Q.** (German.) **Experimental Determination of Stresses in Structural Parts.** S. Schwaigerer. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Nov. 11, 1952, p. 1025-1036.

Methods and instruments for measuring internal and load stresses. 27 ref. (Q25)

**90-Q.** (German.) **Proper Selection of Methods of Measuring Elongations.** Kurt Fink. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Nov. 11, 1952, p. 1037-1038.

Brief discussion. 25 ref. (Q27)

**91-Q.** (Russian.) **Solution of Axisymmetrical Problems of the Theory of Elasticity.** K. V. Solianik-Krassa. *Doklady Akademii Nauk SSSR,* v. 86, Sept. 21, 1952, p. 481-485.

A mathematical discussion. (Q21)

**92-Q.** (Russian.) **The Mechanism of Inhibitor Action on Hydrogen Embrittlement of Steels in Sulfuric Acid.** Z. A. Iofa and E. I. Liakhovetskaia. *Doklady Akademii Nauk SSSR,* v. 86, Sept. 21, 1952, p. 577-580.

Bend tests on steel wires were used to study the above. Data are tabulated. 11 ref. (Q23, Q5, CN)

**93-Q. Scope and Limitations of Photo-Elastic Stress Analysis.** H. T. Jessop. *Engineering,* v. 174, Dec. 26, 1952, p. 833-834.

Two and three-dimensional techniques, transferring results from model to prototype, and accuracy of the photo-elastic method. Diagrams and photographs. (Q25)

**94-Q. An Investigation of the Plastic Behaviour of Metal Rods Subjected to Longitudinal Impact.** J. D. Campbell. *Journal of the Mechanics and Physics of Solids,* v. 1, Jan. 1953, p. 113-123.

Some experiments were carried out, using Al alloy, to obtain information regarding plastic deformation in metal under impact loading, using a new method of test in which some of the main difficulties of impact testing are avoided. Graphs. 8 ref. (Q6, Al)

**95-Q. The Autofrettage of Thick Tubes With Free Ends.** D. G. B. Thomas. *Journal of the Mechanics and Physics of Solids,* v. 1, Jan. 1953, p. 124-133.

Mathematical analysis of expansion by internal pressure of a partially plastic open ended tube of wall-ratio 2:1. Calculated surface strains are described by simple formulas, and comparison is made with previous solutions based on total stress-strain relations. Graphs. 6 ref. (Q23)

**96-Q. The Mechanism of Fatigue of Metals.** A. K. Head. *Journal of the Mechanics and Physics of Solids,* v. 1, Jan. 1953, p. 134-141.

Experiments show that there are three stages in fatigue of metals. Reviews previous investigations. 47 ref. (Q7)

**97-Q. Bend Plane Phenomena in the Deformation of Zinc Monocrystals.** John J. Gilman and T. A. Read. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 49-55.

Experimental work, results and theory. Micrographs and diagrams. 21 ref. (Q24, Zn)

**98-Q. Preferred Orientations in Iodide Titanium.** Carl J. McHargue and

Joseph P. Hammond. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 57-61.

Wire textures for cold rolled and recrystallized iodide Ti and sheet textures for this material produced by cold and hot rolling, and recrystallization at a series of temperatures were determined. Effect of $\alpha \rightarrow \beta$ transformation on sheet texture. Diagrams. 13 ref. (Q24, N5, Ti)

**99-Q. Torsion Texture of 70-30 Brass and Armco Iron.** W. A. Backofen and B. B. Hundy. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 61-62.

Describes additional work on the subject. (Q1, Cu, Fe)

**100-Q. Flow and Fracture Characteristics of the Aluminum Alloy 24S-T4 as Affected by Strain Thermal History.** S. I. Liu and E. J. Ripling. *Journal of Metals,* v. 5, Jan. 1953; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 66-68.

Investigation and results. Graphs. 7 ref. (Q24, Al)

**101-Q. Improving Fatigue Life.** M. K. Gerla. *Machine Design,* v. 25, Jan. 1953, p. 171-173.

Tests on roller chain link plates which show comparative effects of several methods of inducing beneficial residual stresses. Graphs and photographs. (Q7)

**102-Q. Trends in Hollow Drill Steel.** W. H. McCormick and R. W. Persons. *Mining Congress Journal,* v. 38, Dec. 1952, p. 58-61.

New problems introduced, hardness vs. abrasion, stresses found in rods, and notch effect. Trend toward use of alloy steel rather than carbon steel is tabulated. (Q general, T6, TS)

**103-Q. Influence of Nonmartensitic Transformation Products on Mechanical Properties of Tempered Martensite.** J. M. Hodge and W. T. Lankford. National Advisory Committee for Aeronautics, Technical Note 2862, Dec. 1952 13 pages.

Experiments were conducted on SAE 4340 steel, partially isothermally transformed to specific high-temperature transformation products and quenched and tempered to hardness values of from 25-40 Rockwell C. Effects of upper bainite in amounts of 1, 5, 10, 20, and 50%, of 5% ferrite, and of 5% pearlite on tensile, impact, and fatigue properties are evaluated. (Q general, N8, AY)

**104-Q. Delayed Brittle Fracture of Alloy Steel at Low Stress Levels.** C. L. M. Cottrell. *Nature,* v. 170, Dec. 20, 1952, p. 1079-1080.

Results of tests on specimens receiving treatments similar to heat-affected zones of arc welding. (Q23, K1, AY)

**105-Q. Work-Hardening of Annealed Mild Steel Under Static and Dynamic Conditions.** A. W. Crook. *Nature,* v. 170, Dec. 27, 1952, p. 1124-1125.

Brief mathematical analysis. Graph. 3 ref. (Q24, CN)

**106-Q. A Critical Evaluation of the Norelco High Angle X-Ray Spectrometer for Elastic Strain Measurements.** S. R. Maloof and H. R. Erard. *Review of Scientific Instruments,* v. 23, Dec. 1952, p. 687-692.

Theory of measuring elastic strains in metals with an X-ray spectrometer. Comparison with X-ray back-reflection film method. Effect of elastic anisotropy on X-ray stress determinations. Example is given of an X-ray determination of Poisson's ratio in different crystallographic directions in a FS8742 steel. Graphs and diagrams. (Q21, AY)

**107-Q. On the Rigidity Modulus and Its Temperature Coefficient of the Alloys of Cobalt, Iron, and Chromium.** Hakaru Masumoto and Hideo Saito. *Science Reports of the Research Institutes, Tohoku University,* v. 4, June 1952, p. 246-254.

Investigation to measure modulus of rigidity and its temperature coefficient for alloys of Co, Fe, and Cr with specimens in the form of thin wire. Tables and graphs. (Q23, Co, Fe, Cr)

**108-Q. Influence of Mechanical and Electrolytic Polishing on the Micro and Macro Hardness of Metals.** *Sulzer Technical Review,* no. 3, 1952, p. 17-23.

Influences of various methods of polishing and results of experimental measurements. Conclusions drawn are confirmed by microscopic investigation of metal and X-ray diffraction photographs. Materials used were austenitic Cr-Ni steel, electrolytic Fe, and carbon steel. (Q29, M21, SS, Fe, CN)

**109-Q. Mechanical Strength of Carbon Steels At High Temperatures.** M. A. Zaikov. Henry Brutcher Translation 2860, 20 pages. (From *Zhurnal Teknicheskoi Fiziki,* v. 19, no. 6, 1949, p. 684-695.)

A series of experiments to gather data on plasticity and strength of carbon steel. (Q23, CN)

**110-Q. Bending Fatigue Strength of Nitrided Specimens Having Different Diameters.** K. Wellinger and P. Gimmel. Henry Brutcher Translation 2946, 4 pages.

Previously abstracted from original in *Archiv für das Eisenhüttenwesen.* See item 719-Q, 1952. (Q5, SS)

**111-Q.** (French.) **Intercrystalline Fracture of Aluminum-Zinc Alloys.** Eric-Charles Perryman. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 235, Oct. 20, 1952, p. 884-886.

Experiments confirm hypothesis that these alloys, when aged at room temperature, exhibit an exterior grain zone which is less hard than the interior, creating a mechanism which retards intercrystalline fracture. (Q26, Al, Zn)

**112-Q.** (French.) **Service Fractures of Castings Under Cyclic Stresses.** Henri de Leiris. *Fonderie,* v. 81, Oct. 1952, p. 3125-3129.

Properties necessary to withstand repeated stresses. Examples. (Q26, E general)

**113-Q.** (French.) **Fracture of Ferrous Metals by Corrosion and by the Mechanical Stresses Associated With Corrosion.** E. Herzog. *Métaux Corrosion Industrie,* v. 27, Sept. 1952, p. 329-357.

Fracture of ferrous metals by means of interaction of corrosion and static stresses, and fracture caused by corrosion and dynamic stresses. Tables, graphs, and micrographs. 23 ref. (Q26, R1, Fe)

**114-Q.** (German.) **Cracks in Pipe Bends.** Siegfried Berg. *Brennstoff-Wärme-Kraft,* v. 4, Dec. 1952, p. 413-415.

Observations were made of cracks along the "neutral fibers". Superheated and cast pipe bends showed that stress inside pipe, caused by bending, is covered by a well-distributed normal stress which can lead to a high total stress and, under a change of load, to fracture. Photographs. 10 ref. (Q5)

**115-Q.** (German.) **Hypotheses on the Effect of Size and Shape During Repetition of Dynamic Stress.** A. Troost. *Metall,* v. 6, Nov. 6, 1952, p. 665-674.

Review on basis of literature. Law of similarity and notch effect, types of experimental investigations, stress and deformation, law of uniform relative stress decay, constancy of depth of stress zone, and influence of stress gradients. Diagrams. 45 ref. (Q27)

**116-Q.** (German.) **Practical and Specialized Application of the Turning Process for the Determination of Residual Stress.** H. Bühler and W. Schreiber. *Metall,* v. 6, Nov. 6, 1952, p. 685-688.

Practical application of the Heyn-Bauer process to specialized processes. Data are tabulated and charted. 11 ref. (Q25, ST)

**117-Q.** (German.) **The Hardness Measurement During Ball Pressure Tests With Depth Measurement of Preliminary Load.** H. Kostron. *Metall,* v. 6, Nov. 6, 1952, p. 688-692.

A process by which ball pressure hardness, according to class, can be determined with preliminary-load hardness testers. Advantages of the process. Diagrams. 18 ref. (Q29)

**118-Q.** (German.) **The Complete Determination of a Characteristic State of Tension in Solid and Hollow Metallic Cylinders.** Hans Bühler. *Zeitschrift für Metallkunde,* v. 43, Nov. 1952, p. 388-395.

Electrical strain gages were used to determine the stress state of steel and brass cylinders. Includes charts and tables. 32 ref. (Q25, Cu, ST)

**119-Q.** (Italian.) **The Effect of the Dimension in the Fatigue Tests of Metals. Statistical Results.** R. Cazaud. *La Metallurgia Italiana,* v. 44, Oct. 1952, p. 512-517.

Significance of results of alternating tension-compression and rotating beam tests. Composition, mechanical properties, and statistical results are tabulated. Diagrams. 12 ref. (Q7)

**120-Q.** (Book.) **Advanced Mechanics of Materials. Ed. 2.** F. B. Seely and J. O. Smith. 680 pages. John Wiley & Sons, Inc, 440 4th Ave., New York 16, N. Y. $8.50.

Considers mechanical properties of materials for advanced undergraduate and graduate students as well as engineers. Developments of 20 years since first edition are added; two new parts are on influence of small inelastic strains on load-carrying capacity of members, and on instability—buckling loads. Also two new appendixes. (Q general)

**121-Q.** (Book.) **Theory of Elasticity and Plasticity.** H. M. Westergaard. 176 pages. 1952. Harvard Univ. Press, Cambridge, Mass.; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.00.

Serves as an introduction to the theories of elasticity and plasticity, written from the point of view of the engineer although the treatment is entirely theoretical. A historical chapter and details of stress, strain, Hooke's law, basic equation of elasticity, laws of plasticity, strain potential, hollow cylinders and spheres, inertia forces, thermal stresses, the Galerkin vector, and effects of a single force. (Q21, Q23)

# R — CORROSION

**29-R. High-Vacuum Concentration: Its Realm in the Chemical Industry.** *Chemical Engineering Progress,* v. 48, Dec. 1952, p. 589-593; disc., p. 593.

Reduction of corrosion and scale problems as found in concentration processes in the chemical industry. Treats the reduction of scale for-

mation by lowering of temperature and pressure and investigates possibility of material substitutions due either to corrosive properties or to strength of materials. Graphs and diagrams. (R2)

**30-R. Lubricating Large Engines.** Brian Corrigan. *Diesel Power and Diesel Transportation*, v. 30, Dec. 1952, p. 50-54.

Problems associated with lubrication of large gas, dual-fuel, and diesel engines. Bearing corrosion, engine deposits, and engine wear. Tables, micrographs, and photographs. (R7, Q9)

**31-R. Season Cracking of Manganese Brass Propellers.** Yoshio Kaneda. *American Society for Metals*, "Proceedings of the First World Metallurgical Congress", 1952, p. 637-644.

Tests for season cracking in manganese brass propellers. Acidified $FeCl_3$ solutions gave cracks similar to service failures due to residual stresses. (R1, R11, Q25, Cu)

**32-R. A Modified Method for the Estimation of Corrosion Due to the Free Sulfur and Sulfur Compounds in Oils.** Richard A. Patton and Joseph H. Lieblich. *ASTM Bulletin*, Dec. 1952, p. 59-66.

Optical phenomena involved are examined in order to permit an estimation of reliability of present procedure of visual examination. Modified procedure for study of Cu and an appraisal of its merit. Direct comparison of the two procedures. Graphs, tables. (R11, Cu)

**33-R. The High-Temperature Oxidation of Some Cobalt-Base and Nickel-Base Alloys.** A. Preece and G. Lucas. *Journal of the Institute of Metals*, v. 20, Dec. 1952, p. 219-227.

Oxidation characteristics of Co and Ni in temperature range 800-1200° C. Simple apparatus was designed to supply atmosphere similar to that produced in gas turbines. Reactions occurring within scales are compared with mixtures of oxides heated to similar temperatures. Spinel formation is shown to be detrimental to formation of a protective oxide. Tables, graphs, and micrographs. (R2, Co, Ni)

**34-R. Some Observations on Corrosion in Engineering.** S. F. Dorey. *Journal of the Institute of Petroleum*, v. 38, Nov. 1952, p. 885-907; disc. p. 907-918.

Corrosion forms in steam boilers, effect of high temperature, external corrosion of boilers, and caustic cracking; in machinery, marine shafting, oil corrosion, and fretting corrosion; and in oil-process plants. Corrosion due to seawater, dezincification of brasses, $H_2$ attack in steel, "weld decay" of austenitic steel, cast iron corrosion, cathodic protection. (R general, Cu, ST, CI)

**35-R. The Influence of Carbon Content on the Acid Resistance of Titanium and Niobium-Stabilized 18 Cr, 8-14 Ni Steels.** H. T. Shirley and J. E. Truman. *Journal of the Iron and Steel Institute*, v. 172, Dec. 1952, p. 377-380.

Influence of 0.03-0.16% C on intercrystalline corrosion of 18% Cr, 8-14% Ni steels containing Ti or Co. Tables and micrographs. (R1, SS)

**36-R. Fretting Corrosion—What It Is, Its Cause and Possible Preventives.** Arthur H. Allen, *Metal Progress*, v. 62, Dec. 1952, p. 71-76.

Experimental work aimed at determining correctives for field troubles arising from corrosion in aircraft engines. Photographs and micrographs. (R1, CN, SS, AY, Cu, Al)

**37-R. Subsurface Porosity Developed in Sound Metal During High-Temperature Corrosion.** Anton deS. Brasunas. *Metal Progress*, v. 62, Dec. 1952, p. 88-90.

Experiments showed that identical effects were obtained in metal-liquid and metal-gas systems where similar diffusion phenomena occurred. Micrographs. (R2, Ni, Cr, Fe)

**38-R. How We Cured Condenser Tube Corrosion.** H. Weldingh. *Power*, v. 97, Jan. 1953, p. 78-79.

Cause of the corrosion and its cure. Micrographs. (R4)

**39-R. Danger! Boiler Scale at Work.** Paul Brindisi. *Power*, v. 97, Jan. 1953, p. 84-86.

Problems encountered from scale formations, and its removal by chemical means and acid cleaning. (R4)

**40-R. Pad With Neoprene to Save Critical Parts From Corrosion and Water.** *Power*, v. 97, Jan. 1953, p. 103-105.

Application of synthetic primer to metal equipment, and how machinery life can be prolonged. (R10, L26)

**41-R. Grounding and Corrosion Protection on Underground Electric Power Cable Sheaths and Oil or Gas-Filled Pipe Lines.** Robert J. Kuhn. *Power Apparatus and Systems*, Dec. 1952, p. 990-993.

Use of Zn and Cu polarizing cells to ground and prevent corrosion in Pb, black iron, and steel pipes. 4 ref. (R10, Zn, Cu, Pb, CI, ST)

**42-R.** (French.) **Observations on the Behavior of Light Alloys and Heterogeneous Assemblies Exposed to Corrosion by Marine Atmospheres.** A. Guilhaudis. *Revue de Metallurgie*, v. 49, Nov. 1952, p. 791-799; disc., p. 799-800.

Test installations and procedures. Results of corrosion and mechanical tests on Al, Mg, and their alloys and on assemblies of light alloys with steel. Advantages of light alloy bolts and screws. Photographs, charts, and tables. (R3, Q general, Al, Mg, CN)

**43-R.** (German.) **The Corrosion of Different Steels in Liquefied Sulfur Dioxide.** J. Bollinger. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 18, Oct. 1952, p. 321-342.

Experimental studies on the corrosive effect of $SO_2$ alone and with $O_2$ and/or $H_2O$ on different metals under a variety of conditions. Tables and graphs. 32 ref. (R6, ST)

**44-R.** (German.) **The Influence of Alloy Additions and Treatment With Metal Oxide Vapors Upon the Rate of Oxidation of Nickel and Titanium.** Harald Pfeiffer and Karl Hauffe. *Zeitschrift für Metallkunde*, v. 43, Oct. 1952, p. 364-369.

Experimental arrangement. Cr and Ag were used as alloy additions, and $Li_2O$ and $WO_3$ as vapors. Results are tabulated and charted. 23 ref. (R2, Ti, Ni)

**45-R. Behavior of Shipbottom Paints Subjected to Cathodic Protection.** R. P. Devoluy. *Corrosion*. v. 9, Jan. 1953, p. 2-8; disc., p. 8-10.

Investigation to determine whether cathodic protection can be applied to operating ships without inactivating antifouling paints associated with areas of bare steel or Zn. Effects of variations in the composition of the paints used and in variations in dried film thickness of anticorrosive paints used in paint systems. (R10, L26, ST, Zn)

**46-R. Microbiological Corrosion of Buried Steel Pipe.** Frank E. Kulman. *Corrosion*, v. 9, Jan. 1953, p. 11-18.

Field tests of 1943-1949 to determine type and cause of corrosion in buried gas pipes. Microbiological investigation, soil analysis, seasonal variations of corrosion and mechanism of microbiological corrosion. Tables, diagrams. 18 ref. (R1, ST)

**47-R. A Laboratory Method for the Study of Steam Condensate Corrosion Inhibitors.** Harold Patzelt. *Corrosion*, v. 9, Jan. 1953, p. 19-24.

Investigation to control variables which influence corrosion. Environmental conditions which were considered are temperature, dissolved $CO_2$ and $O_2$, pH, electrolytes, liquid velocity with respect to metal, duration of attack. 8 ref. (R10, ST)

**48-R. Laboratory Apparatus for Studying Oil Well Subsurface Corrosion Rates and Some Results.** Paul J. Kalish, J. A. Rowe, Jr., and W. F. Rogers. *Corrosion*, v. 9, Jan. 1953, p. 25-33; disc., p. 33.

Apparatus and test procedure, effect of released acid gases on bottom hole pH values, effect of velocity and temperature on corrosion rate, corrosion rates of sulfide and nonsulfide brines, and corrosion inhibitors. (R4, R11, ST)

**49-R. Designing for Corrosive Services.** F. A. Prange. *Corrosion*, v. 9, Jan. 1953, p. 34-37.

Explores basic philosophy of design and examines inter-relationship between processes, corrosion of materials, fabrication and construction of equipment, physical properties required of structures. (R general)

**50-R. Statistics. A Useful Tool for the Examination of Corrosion Data.** Charles F. Lewis. *Corrosion*, v. 9, Jan. 1953, p. 38-43.

Frequency distributions, preparation, plotting, and interpretation of data, limits of uncertainty, and sample size. (R general, S12)

**51-R. The Relation of the Anodic Corrosion of Lead and Lead-Antimony Alloys to Microstructure.** J. B. Burbank and A. C. Simon. *Journal of the Electrochemical Society*, v. 100, Jan. 1953, p. 11-14.

Technique for determining relation of microstructure of Pb and its alloys to anodic corrosion in $H_2SO_4$. Method is used to show how corrosion of Pb and its hypo-eutectic Sb alloys are related to microstructures. Aspects of corrosion taking place in Pb-acid storage battery. Micrographs. 10 ref. (R5, Pb)

**52-R. Protection of Exterior Steel Surfaces by Paint.** Rick Mansell. *Organic Finishing*, v. 13, Dec. 1952, p. 16-17.

Two types of corrosion of steel under water, and protection offered by organic coatings. Special precautions taken during finishing. (R4, L26, ST)

**53-R.** (German.) **The Influence of Material Chemical Factors on the Corrosion of Metals.** W. Feitknecht. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 18, Nov. 1952, p. 368-379.

Seeks to set up certain general principles covering the intensity of attack for both surface and localized corrosion. Photographs and 31 ref. (R1)

**54-R.** (German.) **Rate of Solution of Molybdenum in Nitric Acid at 25°.** T. G. Owe Berg. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 269, Aug. 1952, p. 117-119.

Experimental data are charted for various concentrations of $HNO_3$. 2 ref. (R5, Mo)

**55-R.** (German.) **Dissociation of Nitric Acid. III. Rate of Solution of Copper in Dilute Nitric Acid. IV. Rate of Solution of Aluminium in Nitric Acid.** T. G. Owe Berg. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 269, Sept. 1952, p. 210-217.

Part 3: Experiments at 20° C. Part 4: Effects of concentration and degree of Al purity were determined at 25° C. Data are tabulated and charted. (R5, Cu, Al)

**56-R.** (German.) **Regarding the Variations of Potential of Aluminum. I. Experimental Results.** Georg Masing and Dietrich Altenpohl. *Zeitschrift für Metallkunde*, v. 43, Nov. 1952, p. 404-412.

Measurements of Al, subjected to corrosion in NaCl solutions, confirmed existence of short-time varia-

tions of electrochemical potential. Procedure; analysis of the oscillogram; potential behavior of Al; influence of selected conditions on variations of potential; and investigation of surface condition during corrosion. Tables, graphs, and photographs. 12 ref. (R1, P15, Al)

**57-R.** (German.) **Corrosion in Metallic Materials.** M. Werner and W. Ruttmann. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Dec. 1, 1952, p. 1113-1121.
Protective layers and their removal. Causes of intercrystalline, selective, and stress corrosion, resulting from nature of material; also other types, including oxygen corrosion. Various kinds of coatings, including plating. 16 photographs. 18 refs. (R1, R2, L general)

**58-R.** (Book.) **The Fight Against Rust.** British Iron and Steel Research Association, 11 Park Lane, London W.1, England. 2s. 6d.
The Corrosion Committee's activities in the fields of applied and fundamental research. Exposure tests form the bulk of the applied research, test pieces of steel being exposed to the atmosphere from the Polar Circle to Singapore.
(R general)

# S
## INSPECTION AND CONTROL

**27-S Non-Destructive Testing.** O. Vaupel. *Iron and Steel,* v. 25, Dec. 1952, p. 529-532, 534.
Standardization of X-ray and magnetic testing in Germany. (S13)

**28-S. Industrial Fluoroscopy, the 1952 Mehl Lecture.** D. T. O'Connor. *Non Destructive Testing,* v. 11, Fall, 1952, p. 11-22.
Value of X-ray testing to industry. Historical background, and a theoretical treatment of the subject. Graphs and fluorographs. 30 ref. (S13)

**29-S. Modern Techniques in High-Voltage Radiography.** E. Alfred Burrill. *Non Destructive Testing,* v. 11, Fall, 1952, p. 23-27.
Characteristics and economic status. Graphs. (S13)

**30-S. Various Penetrameter Types and Their Limitations.** Norman C. Miller and Gerold H. Tenney. *Non Destructive Testing,* v. 11, Fall, 1952, p. 28-32.
Theoretical and experimental aspects of X-ray penetration measurements for determining the resolution or sensitivity of the radiographic inspection procedure. (S13)

**31-S. Iridium 192 in Industrial Radiography.** J. V. Rigbey and C. F. Baxter. *Non Destructive Testing,* v. 11, Fall, 1952, p. 34-40.
Advantages and disadvantages of above over other gamma sources. Radiographs. (S13, Ir)

**32-S. A Metals Comparator for the Inspection and Classification of Metals.** B. M. Smith. *Non Destructive Testing,* v. 11, Fall, 1952, p. 41-46.
Instrument compares metal parts to a standard, thus maintaining quality control on such characteristics as composition, heat treatment, hardness or surface defects. Provided with either a test head or test coil, it can be used on metal parts of various shapes and sizes. (S general, Q29)

**33-S. Temperature Measurement-Control.** R. L. Nichols. *Petroleum Refiner,* v. 31, Dec. 1952, p. 104-106.
Types of measuring devices, thermal systems, mechanical thermometers, application of resistance thermometers, thermocouples, and pyrometers. (S16)

**34-S. Optical Gaging Comes Out of the Toolroom.** George H. DeGroat. *American Machinist,* v. 97, Jan. 5, 1953, p. 125-140.
Variety of production applications of comparators. Short-run, "on-the-floor" inspection, as well as large-volume quality-control operations and special comparator setups at machines. Photographs. (S14)

**35-S. Rapid Analysis of Hydrogen in Molten Steel by Vacuum Fusion Method.** Yoshio Ishihara and Shigeki Sawa. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 247-255.
A rapid analytical method for hydrogen in steel involving vacuum fusion of steel sample and subsequent measurement of thermoconductivity of the extracted gas. Applications of apparatus in practice. Tables and charts. (S11, ST)

**36-S. High Temperature Thermal Analysis Using the Tungsten-Molybdenum Thermocouple.** H. T. Greenaway, S. T. M. Johnstone and Marion K. McQuillan. *Industrial Heating,* v. 19, Dec. 1952, p. 2270, 2272, 2274, 2276, 2278, 2280.
Equipment involved and the technique employed in measuring temperatures up to 2000° C. High-frequency induction heating is used, and temperature is measured by means of a W-Mo thermocouple, for which a calibration curve is given. (S16, W, Mo)

**37-S. Inspection Techniques for Quality Welding** (Concluded.). William B. Bunn. *Industry & Welding,* v. 26, Jan. 1953, p. 48-49, 51-52, 70-71.
Magnetic particle, dye penetrant, and ultrasonic methods of inspection. (S13, K general)

**38-S. Automatic Pipe Tester Cuts Inspection Costs.** J. B. Delaney. *Iron Age,* v. 171, Jan. 8, 1953, p. 104-105.
Construction and performance of hydrastic tester for pressure tightness. Photographs. (S general)

**39-S. Surface Temperatures.** R. B. Sims and J. A. Place. *Iron & Steel,* v. 25, Dec. 12, 1952, p. 553-558.
New pyrometer for stationary and moving surfaces. (S16)

**40-S. The Quick-Immersion Thermocouple for Liquid Steel. Review of Present-Day Techniques With Practical and Theoretical Studies.** *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 387-402.
Includes papers: "Review of Present-Day Immersion Pyrometry Techniques", D. Manterfield and J. D. Cresswell; "A Theoretical Study of the Response of Quick-Immersion Thermocouple", H. Herne; and "Laboratory Experiments on the Rate of Heating of the Quick-Immersion Thermocouple", J. D. Cresswell. Tables and graphs. (S16, ST)

**41-S. Routine Calibration of Precious-Metal Thermocouples at the Palladium Point.** E. J. Knowles and R. C. Jewell. *Journal of the Iron and Steel Institute,* v. 172, Dec. 1952, p. 409-412.
Technique for determining e.m.f. of a precious-metal thermocouple at melting point of Pd. Simplification of this technique by differential method, which gives equal accuracy. Factors affecting accuracy of calibration. Diagrams. (S16, Pd)

**42-S. Ultrasonics in Engineering.** Frank H. Slade. *Machinery Lloyd* (Overseas Ed.), v. 24, Dec. 20, 1952, p. 69-78.
How ultrasonics are used in inspection of materials by nondestructive techniques to determine position and extent of internal defects, and to produce a change in physical or chemical state of materials during processing. (S13)

**43-S. Which Method to Evaluate Surface Roughness?** Irwin Goldman. *Materials & Methods,* v. 36, Dec. 1952, p. 89-93.
Numerous methods of measuring surface roughness. Advantages of binocular microscope. (S15)

**44-S. Standard Commercial Wrought Copper and Brasses, Nonleaded and Leaded.** *Metal Progress,* v. 62, Dec. 1952, p. 96-B.
Data sheet mechanical properties; fabrication processes and properties. (S22, G general, Cu)

**45-S. Unsuspected Defects Found Ultrasonically.** Frank C. Parker. *Welding Engineer,* v. 38, Jan. 1953, p. 26-27, 54-55.
Types of defects, present and future standards, and pipe inspection program. (S13)

**46-S. Ultrasonics for the Metalworker.** Frank Charity. *Western Machinery and Steel World,* v. 43, Dec. 1952, p. 85-88, 137.
Use for inspection and analysis. Photographs and diagrams.
(S13, S11)

**47-S. Polarographic Determination of Tin in Tin Plating Solutions.** Rafael Diaz. *Plating,* v. 40, Jan. 1953, p. 45-46.
Merit of above analytical control method and procedure.
(S11, L17, Sn)

**48-S. Influence of Strain Gradient on Brittle Coating Sensitivity.** A. J. Durelli and S. Okubo. *Product Engineering,* v. 24, Jan. 1953, p. 136-137.
Developments in study of influence of strain gradient perpendicular to the crack on the failure of the coating. (S13)

**49-S. Recording and Indicating Instruments for Temperature Measurements Down to 10° K. Using Copper-Constantan Thermocouples.** E. Victor Larson and Robert Mayer. *Review of Scientific Instruments,* v. 23, Dec. 1952, p. 692-694.
Modifications and additions to a standard instrument involved in solution of problems encountered in indicating and recording temperatures as low as 10° K. with CC thermocouples as primary elements. Diagrams and photographs. (S16)

**50-S.** (French.) **A Process Permitting the Elimination of Parasite Waves in Ultrasonic Testing of Metallic Specimens.** Louis Braujard. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 235, Oct. 13, 1952, p. 804-806.
Experiments show that spurious harmonics are due to surface waves directly from transmitter to receiver. Proposes a photographic integration process eliminating these echoes. (S13)

**51-S.** (German.) **Testing Spring Steels by Means of F. Förster's Flaw Detecting Device.** Kurt Mathesius and Harro Bentke. *Stahl und Eisen,* v. 72, Dec. 4, 1952, p. 1587-1591, disc., p. 1591-1595.
Design, operation, sensitivity, and influences of several variables such as cathode ray brightness and direction of magnetization. (S13, ST)

# T
## APPLICATIONS OF METALS IN EQUIPMENT

**23-T. World's Largest Wing Tanks.** William P. Brotherton. *Aero Digest,* v. 65, Dec. 1952, p. 90, 92, 94, 96-99.
Fabrication of Al tanks by means of spot welding techniques.
(T24, K3, Al)

**24-T. Springs.** W. E. Frost. *North East Coast Institution of Engineers*

*& Shipbuilders, Transactions,* v. 69, Pt. 2, Dec. 1952, p. 91-110.

Methods of manufacture of laminated and helical steel springs. The latter are made both hot (hardened and tempered) and from hard drawn wire. The complex stresses existing in both types. Various analyses and treatments, and methods of improving life at higher stresses by grinding, shot peening and vapor blasting. Diagrams and graphs. (T7, Q25, AY)

**25-T. How to Save Those Critical Alloys.** *Petroleum Processing,* v. 7, Dec. 1952, p. 1776-1777.

Means to conserve Ni and Mo in ferritic alloy steels used in refineries for both high and low-temperature service. Applies largely to alloys used primarily in pipe, tubing, cast and forged valves, fittings, and accessory equipment.
(T29, AY, Ni, Mo)

**26-T. Magnesium Gains Favor as Plane Metal.** Irving Stone. *Aviation Week,* v. 57, Dec. 29, 1952, p. 31-34.

Fabrication of cast parts for various types of planes. Finish problems, corrosion data, and individual parts.
(T24, L general, R general, Mg)

**27-T. Frigidaire Mobilizes Modern Techniques.** *Canadian Metals,* v. 15, Dec. 1952, p. 40, 42, 44.

Fabrication of sheet steel to finished ranges, refrigerators, and many other products.
(T10, G general, ST)

**28-T. Aluminium As a Cable Sheathing Material.** D. McAllister. *Engineer,* v. 194, Dec. 19, 1952, p. 819-823; Dec. 26, 1952, p. 854-857.

New techniques which were developed for sheathing and handling cables, together with an account of general properties of Al sheaths. Advantages and disadvantages of Al, production of Al, and extrusion. General properties of Al sheaths, ease of installation, process of jointing, and resistance to corrosion. Diagrams and photographs. 15 ref. (T1, Al)

**29-T. Stainless Steel Parts Reduce Maintenance Costs.** Milton Gallup. *Iron Age,* v. 170, Dec. 25, 1952, p. 68.

Maintenance and downtime can be reduced by replacing carbon steel nuts, bolts and other parts with stainless steel parts. (T7, SS)

**30-T. More Aluminum Use.** *Light Metal Age,* v. 10, Dec. 1952, p. 22-24.

Future uses of Al. Predicts oil and gas industry to become high consumer. (T27, Al)

**31-T. Aluminium in Polar Exploration.** Wilfred Deacon. *Light Metals,* v. 15, Dec. 1952, p. 386-389.

Use of Al during the early explorations of the Polar region and the British expedition now in North Greenland. (T general, Al)

**32-T. The Use of Stainless Steel for Filters.** *Machinery* (Lloyd), v. 24, Dec. 1952, p. 89-93.

Recent development in field of filtration. Method of manufacture, cleaning, grading, and joining unit compacts. (T29, SS)

**33-T. Alloy Steels for Plastic Moulds and Hobs.** J. Lomas. *Machinery Lloyd* (Overseas Ed.), v. 24, Dec. 20, 1952, p. 79-83.

Mold requirements, high carbon, high Cr steel, and stainless steel for cut molds, hobbing, steels for master hobs, properties required, and forging.
(T6, F22, CN, AY, SS, TS)

**34-T. The Manufacture of Aluminum Sheathed Cables.** *Machinery Lloyd* (Overseas Ed.), v. 24, Dec. 20, 1952, p. 91, 93-95.

Phases in development of the J. & P. Sheathing Process, and details of the process. (1, Al)

**35-T. Beryllium Copper As a Mould and Die Material.** *Machinery* (London), v. 81, Dec. 19, 1952, p. 1277-1279.

Properties, mold and die applications, as inserts for die castings, hob design and materials, heat treatment of cast inserts, and machining and fabricating BeCu.
(T5, E13, G17, Cu)

**36-T. Application of Aluminum Channel Conductors for Station Bus.** E. J. Casey and N. Swerdlow. *Power Apparatus and Systems,* Dec. 1952, p. 1004-1009.

Compares qualities of Cu and Al for station busses. Shape of conductor, connections, and problems encountered in silver-plating of Al. Photographs, diagrams, and tables. 10 ref. (T1, L17, Al, Cu)

**37-T. Color Comes of Age.** *Steel Horizons,* v. 14, Year-end 1952, p. 3-6.

Application of stainless steel in equipment for producing and developing color film. Photographs.
(T9, SS)

**38-T. On the Coal Chemical Frontier.** *Steel Horizons,* v. 14, Year-End 1952, p. 12-13.

Use of stainless steel in equipment for manufacture of coal by-products. (T29, SS)

**39-T. Building a Better Mousetrap?** *Steel Horizons,* v. 14, Year-End 1952 p. 18-19.

Uses of stainless steel wire.
(T8, SS)

**40-T. How to Prevent Failures in Sucker-Rod Joints.** A. A. Hardy. *Oil and Gas Journal,* v. 51, Nov. 17, 1952, p. 371-374, 376-377.

Design features and handling techniques. Laboratory tests.
(T28, S21, ST)

**41-T. Sectioned Steel Columns.** *Overseas Engineer,* v. 26, Jan. 1953, p. 215.

Poles made in short tapered sections of welded sheet steel can be nested for transport or storage and assembled on site by the simple method of end insertion, without bolts, collars or other securing devices. (T26, K13, ST)

**42-T. The Prefab Comes of Age.** Henry F. Unger. *Steelways,* v. 9, Feb. 1953, p. 24-27.

Increasing development and demand for prefabricated steel buildings. (T26, ST)

# V

## MATERIALS
## General Coverage of Specific Materials

**7-V. A Realistic Look at Titanium.** R. W. Parcel. *SAE Journal,* v. 60, Dec. 1952, p. 29-32. (Based on "The New Metal, Titanium: Its Application and Processing", R. W. Parcel.)

Limitations as well as advantages, taking into account physical properties, machinability and fabrication of the metal.
(P general, Q general, G17, Ti)

**8-V. The Commercial Development of Three German Wrought Zinc Alloys.** Jacob Schramm. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 436-456.

Three Zn-base alloys designed to save Al and Cu are described. Difficulties encountered in casting, extrusion, drawing and straightening, and counter measures needed to overcome these troubles. (Zn)

**9-V. Japanese Substitution Steels in the Last War.** Seiji Nishikiori. *American Society for Metals,* "Proceedings of the First World Metallurgical Congress", 1952, p. 483-489.

Compositions and properties. Tables and diagrams. (ST)

**10-V. Germanium and Its Inorganic Compounds.** Otto H. Johnson. *Chemical Reviews,* v. 51, Dec. 1952, p. 431-469.

Occurrence, physical and electrical properties, halogen compounds, oxides and hydroxides, sulfides and nitrides of Ge, germanides and alloys, inorganic acids of Ge, germanates, and physiological properties of Ge compounds. Tables. 213 ref. (Ge)

**11-V. End of the Trail: Zirconium.** *Chemical Week,* v. 72, Jan. 10, 1953, p. 32, 34, 36.

Occurrence, physical properties, beneficiation, and cost. (Zr)

**12-V. High Temperature Metals Part II.** (Concluded.) Albert E. White *Industrial Heating,* v. 19, Dec. 1952, p. 2282, 2284, 2286, 2288, 2290.

Applications, properties and compositions of superalloys. Possible uses in automotive field. Graphs.
(Q general, T21, Sg-h)

**13-V. Aluminum Bronze.** John L. Everhart. *Materials & Methods,* v. 36, Dec. 1952, p. 119-134.

Classification, engineering properties, processing and fabrication, joining practice, heat treatment, surface finishing, applications. (Cu)

**14-V. Titanium, Metal of the Jet Age.** John Loughlin. *Metal Age,* Dec. 1952, p. 10-11, 14.

Physical properties and economic status. (Ti)

**15-V.** (French.) **Industrial Aluminum Alloys.** Jean Herenguel. *Revue de Metallurgie,* v. 49, Nov. 1952, p. 765-776.

Reviews reasons for creation of various alloys, mechanical properties, corrosion resistance, welding, and uses. Probable improvements. Tables, charts, and photographs. 14 ref. (Q general, R general, K general, T general, Al)

**16-V. Lithium Today and Tomorrow.** H. C. Meyer, Jr., and J. Fentress. *Institute Spokesman,* v. 16, Jan. 1953, p. 8-10, 13-14, 16.

How Li is produced from the mine to finished product. Ores, chemical processing, commercial demand. (Li)

**17-V. Properties and Applications of High Purity Iodide Ductile Zirconium.** W. M. Raynor. *Foote Prints,* v. 24, no. 2, 1952, p. 25-35.

Mechanical and physical properties, gas gettering properties, applications, and corrosion resistance. Graphs and Photographs. (P general, Q general, T general, R general, Zr)

**18-V. Zirconium. Another Wonder Metal.** Clyde Williams. *Monthly Business Review,* v. 35, Jan. 1, 1953, p. 15.

Occurrence, properties, uses, and future prospects. (Zr)

**19-V.** (French.) **Refractory Steels.** L. Guitton. *Flamme et Thermique,* v. 6, Oct. 1952, p. 30-36.

Review based on work done at Acieries Electrique d'Ugine, France. Problem of corrosion at high temperatures, principal types of refractory steels, their behavior at low and high temperatures, heat treatment, welding and machining. Tables and graphs.
(R2, K general, J general, G17, SS)

**20-V.** (Book.) **Titanium Bibliography. 1900-1951.** 197 pages. 1952. Battelle Memorial Institute, Columbus 1, Ohio.

Sections on raw materials and ore preparation; chemistry of Ti; chemical analysis for Ti; extraction, reduction, and refining; foundry; mechanical working; powder metallurgy; heat treatment; joining; cleaning, coating, and finishing; constitution and primary structure; transformations and resulting structure; physical, mechanical and surface properties; alloys of Ti; and applications of Ti and its compounds. (Ti)

# EMPLOYMENT SERVICE BUREAU

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## POSITIONS OPEN

### East

METALLURGIST: With Naval Research Laboratory. Appointee will study the properties of silicon and its alloys and other materials which are satisfactory for rectifiers, and will investigate improvements in silicon alloys. A degree in metallurgy and appropriate research experience are required. Write W. G. Torpey, Personnel Officer, Naval Research Laboratory, Code 1817, Washington 25, D. C.

METALLURGIST: Sales experience, familiar with stainless steel pipe and tubing, thorough knowledge of process piping systems in chemical plants, required by large distributor. Some traveling necessary in Eastern States. Write stating age, qualifications, salary, etc. Box 2-165.

### Midwest

METALLURGIST: Large modern plant engaged in manufacture of jet engines requires several men to handle variety of duties in metallurgical laboratory, including vendor contacts, metallography, trouble-shooting. Long-term government contracts assure years of steady employment. Write: Studebaker Corp., Salaried Personnel Dept., 5555 Archer Ave., Chicago, Ill.

RESEARCH AND DEVELOPMENT METALLURGISTS: We have attractive positions open for graduate metallurgists. Assignment in both ferrous and nonferrous metallurgy in new laboratory of large automotive plant in Detroit. Salaries are attractive and advancements are excellent. Box 2-25.

METALLURGICAL ENGINEER: Recent metallurgical engineer graduates for research in new laboratory. Field includes heat treatment, atmospheres and process development. Box 2-30.

RESEARCH METALLURGIST: A position is open for a recent metallurgical graduate desiring to specialize in research metallography. Activity includes phase diagram work, phase identification in alloy development, and metallographic aspects of a wide variety of research and development projects. Well-equipped laboratory. For application, write briefly to: Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, 35 West 33rd St., Chicago 16, Ill.

RESEARCH ENGINEERS: Metallurgical and electrical. Two permanent positions with leading manufacturer of rotary solenoids, circuit selectors and related devices. Men selected will head their sections. Master's degree and two years laboratory experience desired. Salary open. Box 2-35.

RESEARCH CHEMIST: Industrial laboratory performing metallurgical research requires Ph.D. in analytical and inorganic chemistry, or equivalent, to investigate metals, ores, alloys, and other inorganic substances and to develop new processes and materials. Perform whatever independent research is required to satisfy these objectives. Send outline of qualifications, personal background, and educational summary. Box 2-40.

PILOT PLANT DEVELOPMENT ENGINEER: Industrial research laboratory requires men to assume operating responsibility associated with chemical pilot plant development. Scope of engineering activity may involve design of apparatus to carry out a chemical operation, construction, and maintenance of such equipment, evaluation of facility's efficiency, determination of required alterations, and supervision of laboratory personnel. Send outline of qualifications, personal background, and educational summary. Box 2-45.

PHYSICAL CHEMIST: Conduct basic research in an industrial laboratory on the physical chemistry of liquid metals. Organize and execute program leading to practical improvements in methods and materials of oxidation, deoxidation, desulphurization, of steel and solution of other problems encountered in melting of steel and other metals. Please send outline of qualifications, personal background, and educational summary. Box 2-50.

METAL-CERAMIC METALLURGIST: Industrial research laboratory requires man to initiate programs on metal ceramics and related applications of powdered metallurgy; conduct independent investigations as well as direct group of technical men engaged in metal ceramic research. Fields covered will include development and evaluation of new types of metal ceramics and studies of fabrication techniques. Research may include fundamental studies on nature of the bond and reasons for high-temperature strength of metal ceramics. Send outline of qualifications, personal background, and educational summary. Box 2-55.

METALLURGICAL RESEARCH CHEMIST: Industrial research analytical laboratory requires chemist to make analyses of metals and ores. Develop new or improved analytical methods for investigating metals, alloys, and ores. Apply chemical processing formulas and chemical tests for metallic materials and products in various stages of processing. Assist in development of chemical processes for extracting, separating, and refining metals. Send outline of qualifications, personal background, and educational summary. Box 2-60.

CORROSION CHEMIST: Industrial laboratory performing metallurgical research requires men to initiate and carry out fundamentals in various corroding media. Develop testing techniques for investigating electrochemical phenomena which may be involved in the corrosion of various metals in different environments. Ultimate objective of research is origination of new alloys with superior corrosion resistance and development of treatments which will enhance corrosion resistance of present materials. Send outline of qualifications, personal background, and educational summary. Box 2-65.

PHYSICAL METALLURGISTS: Opportunity for graduate study toward M.S. or Ph.D. degree while employed as research assistant on fundamental research project in well-equipped modern laboratory at large state university. Applications now accepted for qualified candidates. Box 2-70.

METALLURGIST: Immediate opening for graduate with one to five years experience. Work in field of high-temperature metallurgical research. Excellent opportunity for recent graduate to enter research field at significant level. Only those with high scholastic averages are sought. Write: Cornell Aeronautical Laboratory, P.O. Box 235, Buffalo 21, New York.

### Southwest

METALLURGICAL ENGINEERS: Perform failure analyses and special investigations of steel and alloy equipment, ferrous and nonferrous, in petroleum and petro-chemical industry. Challenging problems in high-temperature service, various corrosive services, welding of high-strength and alloy steels, etc. Opportunities for professional recognition. Write giving qualifications and experience to: Phillips Petroleum Co., Employee Relations Dept., Bartlesville, Okla.

## POSITIONS WANTED

METALLURGICAL ENGINEER: B.S. degree, age 36. Thirteen years diversified supervisory experience in ferrous and nonferrous metallurgy including process control, trade investigation, research, development, teaching, and production. Particularly experienced in production and fabrication of strip steel, tinplate, alloy and stainless steels, titanium and zirconium metals. Desires managerial position in production or executive position in technical work with direct line responsibilities. Box 2-75.

EXECUTIVE ENGINEER: Desires position with strong, progressive organization which can use knowledge of manufacturing, administration and engineering offering possibility of advancement. Graduate chemical engineer and business administration. Nineteen years diversified experience. Age 41. Box 2-80.

MATERIALS ENGINEER: M.S. degree in metallurgy, age 36, married. Twelve years diversified experience in all phases of metallurgical activities in ferrous and nonferrous metallurgy. Heavy on welding, brazing, heat treating, specifications, and quality control. Experienced in research development, production, and laboratory supervision. Desires position with responsibilities in metropolitan North Jersey area. Box 2-85.

METALLURGIST: French, age 39, 15 years experience in large American and French organizations. Broad knowledge of ferrous and nonferrous from conventional to vacuum metallurgy. Can organize pilot plant development and research projects of fundamental nature. Location immaterial. Resident of U. S. Box 2-90.

METALLURGICAL ENGINEER: B.S. degree, veteran, 31 years of age, married with two children. Four years research, development, production and supervisory experience in steel casting industry. Experience includes foundry, sand welding, chemical analysis, heat treating and service failure investigations pertaining to steel castings. Desires position in development or production. Box 2-95.

METALLURGIST: Married, age 42. Eleven years supervisory experience in both laboratory and production metallurgy. Has organized two metallurgical-chemical laboratories. Experienced in all kinds of heat treating, including induction heating. Has organized production heat treat department. Experienced in shot cleaning and peening. Considerable research in ferrous and nonferrous metallurgy. Prefers staff or production position. Will relocate. Box 2-100.

METALLURGICAL ENGINEER: M.S. degree. Executive caliber. Experience with leading research organization in titanium technology, manganese ore up-grading. Worked with steel openhearth, lead smelter. Available for challenging assignment in Asia, preferably India. Prefer technical development or operation. Would welcome sales representation in Asia for metallurgical equipment or ore shipping organization. Box 2-105.

METALLURGIST: Twenty years experience in laboratory supervision, materials and methods research, production trouble shooting, nonferrous mill products production, sales promotion and technical service. Desires to locate in production, technical service or trouble shooting for management. Box 2-110.

METALLURGICAL ENGINEER: B.S. degree. Age 31. One and a half years experience in casting and forging of high-temperature alloys for aviation gas turbines. Served machinist apprenticeship and has worked eight years as production planner, toolmaker, and tool designer. Desires position on East, West or Gulf Coasts offering opportunity for advancement into management. Box 2-115.

METALLURGICAL ENGINEER: M.S. degree in metallurgical engineering. Age 32. Seven years experience involving fabrication heat treating failures and recommendation. Heat resistant alloy development research involving application of X-ray diffraction to study the effects of annealing. Nonferrous alloy development. Position in research or development desired. Box 2-120.

METALLURGIST: Young executive presently employed as plant superintendent of nonferrous rolling mill, desires connection with a progressive basic or manufacturing company. Metallurgical engineering background. Experience includes industrial relations, industrial engineering, maintenance, production control, quality control, mill systems of accounting for cost control, and all phases of supervisory management. Box 2-125.

METALLURGICAL ENGINEER: M.S. in engineering physics and courses equivalent to B.S. in metallurgical and electrical engineering. Age 39, married, one son. Six years of aircraft, jet, high-temperature alloys experience in metallography, heat treatment, quality control, analysis of data. Seven years as instructor of engineering physics, applied spectroscopy, electrical measurements. Technical publications. Desires project or production engineering position in Midwest. Complete references. Box 2-130.

ENGINEER: With executive training. Age 42. Past 13 years as engineering executive responsible for laboratories and production for large manufacturer of automotive parts. Experience also includes college teaching and consulting service. Box 2-135.

FOUNDRY METALLURGIST: Ten years diversified experience in all phases of foundry. Young, college education, ambitious, pleasing personality, works well with others. Employed at present as chief metallurgist. Desires association with progressive foundry company in supervisory position. Prefers South but will consider other locations. Proven background and can furnish excellent references. Box 2-140.

SENIOR METALLURGIST: Presently employed as senior metallurgist in metallurgical laboratory in India. Has immigration visa for the United States, with intention of applying for citizenship. B.S., M.S., and Ph.D. degrees with first honors in physical chemistry, Indian university. M.S. and M.E. degrees from University of California in metallurgical engineering. Two and one half years with American automotive plant. Married, two children. Christian, age 32. Box 2-145.

INDUSTRIAL SALES—METALS: Solid personal relations with major accounts in central Jersey. Ten years diversified sales background. Proof of outstanding sales record. Prefers metals distribution or allied field connection offering advancement potential. College. Confidence expected. $8000 minimum. Available March. Box 2-150.

METALLURGICAL ENGINEER: Design and construction of integrated steel plants, blast furnace operating experience, ferrous continuous casting program, plant engineer. Relocate west of Mississippi. Box 2-160.

METALLURGIST: Age 33, B.S. degree. Five years teaching experience. Twelve years industrial experience, including laboratory, engineering, specifications and production phases of steelmaking. Well versed in metallography, heat treatment and physical metallurgy concerning steel products. Particularly interested in position involving steel forgings in a supervisory or sales capacity. Box 2-170.

ENGINEER: Graduate, chemical-metallurgical, of supervisory caliber. Three years diversified experience in development, production, and inspection of automotive, ordnance equipment. Proven technical service ability. Desires position in manufacturing or technical service with management opportunity. Release from U. S. Navy in March. Age 26, married, any location. Box 2-175.

MANUFACTURERS REPRESENTATIVE: Metallurgical engineer, well established in Chicago, wants additional account. Wide acquaintance in chemical, pharmaceutical, and food processing industries. Stainless steel specialist. Box 2-180.

**RESEARCH METALLURGIST:** Experienced in ferrous and mechanical and physical metallurgical research, either industrial or academic. Graduate degree preferred. Research department of a major user of metal products located in the Chicago area. Age under 40. All replies will be held confidential. Box 2-5, Metals Review.

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